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ABSTRACT

This first volume of a two-volume curriculum guide contains 11 problem areas selected for study to be included in a core curriculum for 11th-grade or third-year students enrolled in a metropolitan agricultural program. The 11 problem areas are divided into eight units: Orientation to Agricultural Occupations (Gaining Employment), Supervised Occupational Experience (Evaluating Supervised Occupational Experience Programs and Analyzing Student Records), Leadership in Horticulture/Agriculture (Utilizing Horticultural Organizations and Resources), Horticultural /Agricultural Mechanics (Repairing Greenhouse or Horticultural Equipment, and Plumbing and Irrigation Systems), Plant Propagation (Propagating Softwood Cuttings, and Propagating Woody Plants by Budding and Grafting), Plant Identification (Reviewing and Applying Plant Identification Skills), Growing Horticultural Crops (Growing Small Fruits and Brambles, and Growing Tree Ftuits), and Identifying and Controlling Pests of Horticultural Plants (Handling Pesticides Safely and Passing Certification Tests). A rationale for omitting Unit I, on Urban Animals, From Core III, is contained in the document. Each problem area includes some or all of the following components: suggestions to the teacher, a teacher guide (containing objectives, suggested interest approaches, anticipated student problems and concerns, suggested learning activities and experiences, application procedures, an evaluation, references, and aids), information sheets, student worksheets or assignment sheets with a key, job sheets or laboratory exercises, transparencies, a discussion guide for transparencies, and sample test questions with a teacher key. (YLB)

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CORE III MATERIALS FOR METROPOLITAN AGRICULTURE/ HORTICULTURE PROGRAMS

UNITS A-I

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Product Abstract

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16. General Description:

This curriculum guide includes 22 problem areas selected as suggested areas of study to be included in a core curriculum for eleventh-grade or third-year students enrolled in a metropolitan agriculture program.

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LIST OF UNITS AND PROBLEM AREAS
METROPOLITAN AGRICULTURE PROGRAM
CORE III

UNIT A: Orientation to Agricultural Occupations

PROBLEM AREAS:

1. Gaining employment

UNIT B: Supervised Occupational Experience

PROBLEM AREAS:

1. Evaluating supervised occupational experience programs and analyzing student records

UNIT C: Leadership in Horticulture/Agriculture

PROBLEM AREAS:

1. Utilizing horticultural organizations and resources

UNIT D: Horticultural/Agricultural Mechanics

PROBLEM AREAS:

1. Plumbing and irrigation systems
2. Repairing greenhouse or horticultural equipment

UNIT E: Plant Propagation

PROBLEM AREAS:

1. Propagating softwood cuttings
2. Propagating woody plants by budding and grafting

UNIT F: Plant Identification

PROBLEM AREAS:

1. Reviewing and applying plant identification skills

UNIT G: Growing Horticultural Crops

PROBLEM AREAS:

1. Growing small fruits and brambles
2. Growing tree fruits

UNIT H: Identifying and Controlling Pests of Horticultural Plants

PROBLEM AREAS:

1. Handling pesticides safely and passing pesticide certification tests

UNIT I: Urban Animals

UNIT J: Soil Science and Conservation of Natural Resources

PROBLEM AREAS:

1. Understanding soils
2. Selecting soil sites for urban use
3. Attracting birds to your back yard

UNIT K: Horticultural/Agricultural Products

PROBLEM AREAS:

1. Selecting and buying horticultural tools and equipment

UNIT L: Landscape Design, Establishment and Maintenance

PROBLEM AREAS:

1. Pruning evergreens
2. Surveying, grading and tiling
3. Constructing fences and retaining walls
4. Interior plantscaping

UNIT M: Retail Floriculture

PROBLEM AREAS:

1. Handling and preparing cut flowers
2. Ordering and buying cut flowers
3. Making corsages, nosegays and table arrangements

SUGGESTIONS FOR USING CORE MATERIALS

These instructional materials and teaching aids have been designed to improve instruction and increase student learning. Each problem area includes some or all of the following components:

1. Suggestions to the teacher
2. Teacher's guide
3. Competency inventory
4. Information sheets
5. Student worksheets or assignment sheets and key
6. Job sheets or laboratory exercises
7. Transparencies
8. Discussion guide for transparencies
9. Sample test questions and teacher's key

This combination of instructional materials is intended for use as a resource unit. This means that teachers should selectively choose those components and those parts which they need to achieve their teaching objectives. The project staff does not recommend that teachers "teach" the core program as it is presented. Instead, teachers should personalize and localize the materials for the particular group taught and, wherever possible, add other materials and teaching techniques to enrich the core program.

Teachers could teach all problem areas included in the core curriculum to a specific class, but this would not be advisable considering the variations which exist in horticultural programs, students' needs and interests, and program objectives. Instead, teachers should select problem areas for a "local core" and supplement them with other problem areas important in the local area. Another suggestion is that the entire problem area need not be taught to a given group during a given year. For example, teachers may want to teach part of the parliamentary procedure problem area to freshmen and teach the remaining part to an advanced class.

Specific suggestions for using the different components of a problem area are presented in the following section.

1. Suggestions to the teacher. These suggestions are included on the first page of each problem area. Teachers should read these suggestions before problem areas are scheduled for the year. Decisions need to be made regarding which problem areas will be taught, when they will be taught and the approximate number of days to be devoted to each problem area. On the basis of these decisions, teachers can construct a course calendar.

   In some cases, the suggestions also indicate the preplanning that needs to be accomplished before instruction begins. Instructional materials not included in the problem area need to be ordered in advance.

2. Teacher's guide. The teacher's guide is not a lesson plan. It is a source of teaching ideas which may be used by the horticulture teacher to conduct an effective instructional program. Each guide includes more material than most teachers would use. Teachers

should select from the several interest approaches and teaching activities those suggestions which seem more appropriate for the local situation. The teacher's guide emphasizes a problem solving method and a student-centered, activity approach. Lecture-presentation, rote memorization of facts and subject-matter mastery should be kept to a minimum. The teacher's guides include suggestions for carrying learning to the "doing" level. Application of classroom learning to S.O.E.P.'s and FFA activities is an important part of the teaching process.

3. Competency Inventory. A listing of job competencies for most problem areas has been included in the Core III materials. These listings are included to help teachers focus on skill development in the instructional program for advanced students. The competency inventories can be used to make students aware of the skills important on the job. By including them in the Core III program, the developers intend to emphasize the importance of competency based instruction for students who are preparing for entry level employment.

4. Information sheets. These sheets have been prepared for those problem areas where subject matter may be difficult to locate. If reference materials are not available, the teacher may want to duplicate copies of the information sheets for class use.

5. Student worksheets or assignment sheets and keys. These exercises are designed as classroom activities for student use. They may provide a change of pace for students when they have grown tired of other activities which may be overused. Most exercises include a teacher's key with suggested answers.

6. Job sheets and laboratory exercises. In some problem areas, such as the horticultural/agricultural mechanics areas, job sheets have been provided which include a step-by-step procedure for performing horticultural jobs. These sheets may be used to guide students engaged in individualized learning and to take a load off the busy teacher who has a large class involved in a variety of learning activities.

7. Transparencies. Some of the problem areas include transparency masters which can be used to prepare overlays, and others include small reproductions of transparencies developed for the Core Project which are available from Vocational Agriculture Service, University of Illinois.

8. Discussion guide for transparencies. Most of the transparencies included in the core materials do not include on the overlay any narration or explanation. The discusson guide provides teachers with some suggested points to bring out in the discussion of a transparency, including explanations, descriptions and discussion questions related to the transparency.

9. Sample test questions and key. The sample test questions are not intended to be used as a test. The teacher can select questions

from those included in the problem area, if they are appropriate, and add others as needed. Some teachers may choose not to administer a test at the close of each problem area and to prepare a comprehensive test at the end of a unit.

The numbering system found at the bottom of each page includes five digits or letters. The first character is a capital "M", which stands for Metropolitan. The Roman numeral III designates the material as part of Core III. The letters which run from A-M designate the unit. The fourth character is a numeral which indicates the problem area within the unit (1 means first, 2 for second, etc.). The last digit is the page number. All pages are numbered consecutively and the pages in each problem area start with "one".

The color scheme used in the Illinois Core Curriculum is as follows:

Raspberry--Introductory Sheets

Salmon--Suggestions to the Teacher

Tan--Teacher's Guide

Gold--Competency Inventory

Light Blue--Information Sheets

Ivory--Student Worksheets

Pink--Job Sheets/Laboratory Exercises

Lime--Teacher's Key to Student Worksheets

White--Transparencies and Transparency Discussion Guides

Green--Sample Test Questions and Teacher's Key

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UNIT I: URBAN ANIMALS

RATIONALE FOR OMITTING URBAN ANIMALS IN CORE III

A unit on urban animals which consisted of two problem areas was included in Core I. The original outline for Core II included additional problem areas on urban animals, but a decision to drop them from the Core was made. Problem areas on animals do have a place in an urban agriculture program because occupations which require knowledge and skills related to urban or companion animals are important. However, the following rationale was used to justify the dropping of urban animal problem areas from Core II and Core III:

1. The development of local short and long-range plans for vocational education programs in agriculture and the reimbursement of agricultural occupations programs is based on taxonomic areas of agriculture as defined by the U.S. Department of Education. Mixing horticulture and animals in the core curriculum may suggest to some schools that their local programs can follow this pattern and be approved for reimbursement.

2. A reasonable case can be made for including both horticulture and animals in Core I, II and III if these three years are to be taught as the occupational orientation phase of the agricultural occupations programs. However, since many urban schools in Illinois are presently offering only two or three years of agriculture/horticulture, it is reasonable to assume that, at least in some schools, Core I, II and/or Core III may be used primarily for the skill development phase of the agricultural occupations program.

3. Accordingly, the Illinois Joint Staff in Agricultural Education recommended that animals and horticulture not be mixed in Core II or Core III.

Schools which need to offer an urban agriculture program which includes more than the horticulture area should refer to the Rural Agriculture Program Core Curriculum for alternative areas of instruction.

Schools which need assistance in developing the agricultural occupations program according to guidelines and requirements established by the Illinois State Board of Education, Department of Adult, Vocational and Technical Education are encouraged to contact their Regional Administrator or the Occupational Consultants for Agriculture.

UNIT A: ORIENTATION TO AGRICULTURAL OCCUPATIONS

PROBLEM AREA: GAINING EMPLOYMENT

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with third-year students in a horticultural occupations program who are ready to seek employment. The recommended time for teaching this problem area is January, so students will have adequate time to prepare themselves for the spring job market.

The instructional materials included in this problem area have been developed based on the assumption that students have been instructed on careers in urban agriculture (see Metropolitan Core I, Unit A). The estimated instructional time for this problem area is 5-10 days, depending on how far the teacher wishes to go in developing various skills necessary for gaining employment. It is hoped that instructors would reinforce these skills throughout the school year as students work and communicate with each other in classroom and laboratory settings. Supervised occupational experience programs also provide an excellent opportunity for instructors to reinforce communication, personality and responsibility skills on a one-to-one basis with students.

The instructor is encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt this problem area to their local situation.

CREDIT SOURCES:

These materials were developed through a funding agreement, R-33-13-D-0362-466 with the Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Research and Development Section, 100 North First Street, Springfield, Illinois 62777. Opinions expressed in these materials do not reflect, nor should they be construed as policy or opinion of the State Board of Education or its staff.

The teacher's guide, information sheets, student worksheets, and sample test questions were developed by Susie Osborne, Department of Vocational and Technical Education, University of Illinois. Transparency masters and the transparency discussion guide were developed by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Metropolitan Core Curriculum Field Test Teachers.

TEACHER'S GUIDE

I. Unit: Orientation to agricultural occupations

II. Problem area: Gaining employment

III. Objectives: At the end of this problem area the student will be able to:

1. Assess personal interests, values and abilities necessary for selecting future educational training and/or occupational choices
2. Identify personal traits necessary for gaining and maintaining employment
3. Develop a resume
4. Apply for a job
5. Interview for a job
6. Select a post-secondary school.

IV. Suggested interest approaches:

1. Ask each class member to list at least 5 possible career decisions they are going to make by the time they complete their high school education. Ask students to think about and then identify how these decisions may affect their lives. The list of decisions might include such items as: (a) nature of work, (b) location of employment, (c) educational requirements for employment, (d) financial benefits, (e) travel requirements, and (f) marriage plans.
2. Have students identify on paper a particular job they would like to have. Then have students write down the reasons why an employer should hire them for that job, including information on past experiences, education, personality traits, etc. Discuss how this information could be organized into a resume.
3. Conduct a role-play session on job interviews. One role-play should emphasize the proper way to interview for a job and one should emphasize the improper way to interview. Have students discuss the differences between the two interviewing sessions.
4. Invite a resource person (business owner, personnel manager, or principal) to discuss "What do I look for on resumes, application letters and forms and during interviews?".

V. Anticipated problems and concerns of students:

1. How do I determine my personal interests, values, and abilities and match them to possible occupations?
2. What personal traits does an employer look for when hiring employees?
3. How do I develop a resume?
4. How do I go about applying for a job?
5. How do I go about interviewing for a job?
6. What questions should I ask prospective employers during a job interview?
7. How should I follow-up a job interview?
8. Do I need to continue my education to get the job I want? If so, how do I select a post-secondary school?

VI. Suggested learning activities and experiences:

1. Have students complete the Student Awareness/Attitude Inventory Worksheet as a review of what to consider when selecting a career. This worksheet is located in Metropolitan Core Curriculum I Unit A, Problem Area - Careers in Urban Agriculture, pages 29-35.
2. Identify students' immediate concerns relating to career plans and goals. Develop tentative solutions to these problems through class discussion. Select an occupational area of interest to the students, then assign students the task of developing a model career plan one could follow to secure the identified occupation.
3. Distribute Student Worksheet 1 - Comparing Occupational Choices. Have students identify three occupations they have researched and complete the worksheet. Refer to Metropolitan Core I, Unit A, Problem Area - Careers in Urban Agriculture for suggestions on examining selected occupations. Ask for volunteers to report their results and discuss the importance of this information.
4. Divide the class into pairs and have students evaluate each other's efforts on Student Worksheet 1 and select the one occupation which most closely matches their personal characteristics. Have students volunteer to present their opinion as to why they "would" or "would not" like to be employed in this occupation.
5. Explain to students the importance of evaluating their progress toward meeting employment requirements and determining the

areas which need further skill and knowledge development. Use Student Worksheet 2 - Evaluting My Career Goals to help students develop a career plan for one or more occupations in which they are currently interested. Refer to Metropolitan Core I, Unit A, Problem Area - Careers in Urban Agriculture for suggested career references.

6. Have students read VAS Subject Matter Unit 6003 - Human Relations in Agricultural Business. Distribute Information Sheet 1 - Personal Characteristics Necessary for Gaining and Maintaining Employment. Have students select one of the six topic areas and prepare a five-minute report. Use VAS Slidefilm 392 - Human Relations in Agricultural Business to summarize essential facts.

7. Follow-up the slidefilm on the importance of human relations by having students evaluate their own personal characteristics. Distribute Student Worksheet 3 - Evaluating My Personal Appearance, Feelings and Habits. The teacher may also have students answer additional questions regarding personality and responsibility traits located in VAS Subject Matter Unit 6003 - Human Relations in Agricultural Business. Have students discuss methods of improving personal characteristics to make them more employable. Ask students to describe the self-improvement plan they have decided to follow (Part IV - Student Worksheet 3).

8. Distribute Student Worksheet 4 - Self-Improvement: "Do You See Yourself as Others See You?" for students to complete. Have students ask a friend or relative to complete the worksheet also. Compare both sets of answers to assess personality strengths and weaknesses and make changes accordingly.

9. Distribute VAS Subject Matter Unit 6001A - Applying for a Job. Have students select one of the six topic areas and prepare a five-minute report. Use VAS Slidefilm 390 - Applying for a Job to summarize essential facts.

10. Distribute and discuss Information Sheet 2 - Guidelines for Developing a Resume. Have students complete Student Worksheet 5 - Personal Data Sheet. Have students develop their own resume using this information.

11. Distribute and discuss Information Sheet 3 - Guidelines for Writing Letters of Job Inquiry and Application. Have students write a letter of job inquiry and a letter of job application using this information.

12. Distribute actual resumes and letters of application for students to critique.

13. Bring in magazines, such as Florist Review, and newspapers with horticultural job announcements. Ask students to select the jobs they would like to obtain. Have students prepare a

resume, and letter of application for the position. Qualified students may wish to actually apply for the specific job.

14. Invite a representative from a state employment agency to explain how employment agencies can help students gain employment.

15. Have students complete Student Worksheet 6 - Completing a Job Application Form.

16. Distribute and discuss Information Sheet 4 - Making Appointments by Telephone. Arrange with a local horticultural business for students to telephone and make an appointment for a job interview. Have the horticultural businessperson speak to the class the next day to point out the positive and negative aspects of these appointment phone calls.

17. Use Applying For A Job - A Self-Study Guide for Students Including the Job Application Game in one or more of the following ways:

    A. Individual study for students preparing for actual job interviews

    B. Motivational device to help the students realize how their actions affect their lives

    C. Supervised study with other texts and instructional devices such as roleplaying job interviews and completing job applications

    D. Interest approach by playing the Job Application Game, and

    E. As a source of ideas for test questions and role-play demonstrations.

18. Ask students what they would want to ask a prospective employer about a specific job. Discuss which questions would be appropriate to ask during a job interview. After the discussion distribute Information Sheet 5 - Questions I Should Ask During My Job Interview.

19. Distribute VAS Subject Matter Unit 6001 A - Applying For A Job. A list of 94 questions frequently asked during a job interview is given on pages 10 and 11. Ask each student in class how they would answer some of these questions. The questions could also be used when role-playing job interviews.

20. Distribute and discuss Information Sheet 6 - The Do's and Don't's of Interviewing for Jobs. Point out how both verbal and non-verbal forms of communication affect the job interviewing process.

21. Distribute Information Sheet 7 - Negative Factors Observed During Job Interviews. Role-play job interviews having students act out the negative factors. Have another student act out the job interview to demonstrate the positive approach.

22. Have a student read aloud Information Sheet 8 - Letter to Job Applicants. Discuss what the prospective employer meant by the letter.

23. Distribute and discuss Information Sheet 9. Guidelines for Writing a Follow-Up Letter. Have students write a follow-up letter.

24. Utilize the transparency discussion guide for suggested uses of the transparencies included in this problem area.

25. Distribute and discuss Information Sheet 10 - Factors to Consider When Selecting a Post-Secondary School. Have students select two or more schools they are interested in attending and find the answers to the questions on the information sheet.

26. Invite the school counselor to discuss post-secondary educational opportunities including grants, scholarships, loans, college entrance requirements, et cetera.

VII. Application procedures:

1. This problem area will enable students to evaluate and change personal habits and characteristics, which will help make them more employable.

2. This problem area will assist students in the selection of an occupation and/or post-secondary school.

3. This problem area will help prepare students for the job application and interviewing process.

VIII. Evaluation:

1. Evaluate student reports, resumes, application forms and letters.

2. Grade student worksheets.

3. Evaluate student's ability to cooperate and work in groups.

4. Evaluate student's efforts to collect essential information when planning career goals.

5. Prepare and administer a written test using the sample test questions included in this problem area.

6. Evaluate student's participation in role-play sessions.

IV. References and aids:

1. Human Relations in Agribusiness by John Hillison and John Crunkilton available from McGraw-Hill, Inc.

2. Vocational Agriculture Service, 1401 Maryland Drive, Urbana, IL 61801

   A. VAS Subject Matter Unit 6003 - Human Relations in Agricultural Business

   B. VAS Subject Matter Unit 6001A - Applying for a Job

   C. VAS Slidefilm 392 - Human Relations in Agricultural Business

   D. VAS Slidefilm 390 - Applying for a Job

3. Applying For A Job - A Self-Study Guide for Students Including the Job Application Game by P. M. Rath, R. E. Mason and L. J. Phipps available from the Interstate Printers and Publishers, Inc. Danville, Illinois 61832

4. Metropolitan Core Curriculum I, Unit A, Problem Area - Careers in Urban Agriculture

5. Selected information sheets

6. Selected student worksheets

7. Selected transparencies

INFORMATION SHEET 1

DESIRABLE PERSONAL CHARACTERISTICS FOR GAINING AND MAINTAINING EMPLOYMENT

1. Ambitious, desire to work and improve oneself
2. Adaptable, adjusts to new job tasks, accepts work readily
3. Accurate, alert
4. Courteous, considerate
5. Cooperative, does more than what is necessary
6. Confident, natural ability and aptitude for the job
7. Cheerful, pleasant
8. Enthusiastic, energetic, interested in learning
9. Dedicated, loyal
10. Empathetic, understanding, appreciative of others
11. Efficient, knowledgeable of job
12. Dependable, reliable
13. Friendly, works well with others
14. Follows instructions and line of authority
15. Honest
16. Sense of humor
17. Mature, professional, business-like behavior
18. Motivated, positive attitude
19. High morale
20. Self-starting, initiative
21. Respectful, well-mannered
22. Punctual, avoids tardiness, attends regularly
23. Tactful, practices restraint
24. Self-controlled, patient, tolerant
25. Resourceful
26. Neat and organized
27. Works well under pressure
28. Uses good judgment, decision making skills
29. Pleasing personal appearance, well-groomed, well-poised, correct posture
30. Possesses proper oral and written communication skills

INFORMATION SHEET 2

GUIDELINES FOR DEVELOPING A RESUME

A resume is a brief, typed statement or summary of your qualifications and experience used in applying for a job. A resume can be sent along with a letter of inquiry or application to provide the employer with additional information in regard to your background and experience. The information given below should be considered when writing a resume.

I. Information to include in a resume:

   A. Name, address, and phone number

   B. Educational background - name of schools, dates attended, major field of study, subjects studied relating to job, degrees earned

   C. Leadership/student activities, honors and accomplishments

   D. Work experience - list in chronological order both full and part-time jobs, the name and address of company, length of time worked, brief description of duties and responsibilities, and special training programs or courses, involvement in supervised occupational experience programs.

   E. Special technical skills and interests related to the job

   F. References - usually three (Be sure to obtain permission before naming someone as a reference.)

II. Standards to follow for a resume:

   A. Limited to one page if possible

   B. Neatly typed and error free

   C. Logically organized in outline form

   D. Honest listings of qualifications and experiences

   E. Emphasizes your best qualifications by how they are placed and organized on the resume

   F. No unexplained blank periods of time in resume

SAMPLE RESUME

NAME: Pat Simmons
ADDRESS: 702 Arapaho
Sevin, Illinois 60624

TELEPHONE: (217) 377-2000

EDUCATION: High School Diploma - Anticipated June 1984 from Metropolitan High School

SUBJECTS STUDIED:

Vocational Agriculture:	7 semesters	Horticulture:	2 semesters
Business Arithmetic:	1 semester	Bookkeeping:	2 semesters
Greenhouse Management:	1 semester		

WORK EXPERIENCE:

General yard worker for Sevin Summer Playground for two summer vacations-
Did general lawn mowing, trimming of grass and hedges, greeted visitors

TECHNICAL SKILLS:

Trained in the operation of tractors and reel mowers, hand mowers, fertilizer spreaders, and the application of herbicides

LEADERSHIP ACTIVITIES:

National Honor Society
Vice-President, Future Farmers of America
Secretary, Senior Class
Member of Senior Prom Committee

HONORS AND OTHER ACCOMPLISHMENTS:

Horticulture Record Keeping Award
Outstanding Senior Award

REFERENCES:

Mr. Raymond Fox, Instructor
Vocational Agriculture
Metropolitan High School
1200 North Main
Sevin, Illinois 60624

Mr. Gus Jones, Director
Summer Work Program
City of Sevin
705 South Washington
Sevin, Illinois 60624

Ms. D. E. Applesauce
English Teacher
Metropolitan High School
1200 North Main
Sevin, Illinois 60624

INFORMATION SHEET 3

GUIDELINES FOR WRITING LETTERS OF JOB INQUIRY AND APPLICATION

The purpose of a letter of inquiry is to obtain information about possible job vacancies. The purpose of a letter of application is to apply for a specific position that has been publicly advertised. Both letters indicate your interest in working for a particular company, acquaint employers with your qualifications, and encourage the employer to invite you for a job interview.

Letters of inquiry and application represent YOU. Therefore, they should be accurate, informative, and attractive. Your written communications should present a strong, positive, professional image both as a job seeker and future employee. The following list should be used as a guide when writing letters of inquiry and application.

I. Standards to follow for letters of inquiry and application:

   A. Short and specific, one to two pages (details left to resume)

   B. Neatly typed and error free

   C. Attractive form, free from smudges

   D. Logical organized paragraphs which are to the point

   E. Carefully constructed sentences free from spelling or grammatical errors

   F. Positive in tone

   G. Ideas expressed in a clear, concise direct manner

   H. Avoid slang words and expressions

   I. Avoid excessive use of the word "I"

   J. Avoid mentioning salary and fringe benefits

   K. Write a first draft, then make revisions

   L. Proofread final letter yourself, and also have someone else proofread

II. Information to include in a letter of inquiry:

   A. Specify the reasons why you are interested in working for the company and ask if there are any positions available now or in the near future

   B. Express your interest in being considered a candidate for a position when one becomes available

C. Since you are not applying for a particular position, you cannot relate your qualifications directly to job requirements. (However, you can explain how your personal qualifications and work experience would help meet the needs of the company.)

D. Make mention of and include your resume

E. State your willingness to meet with a company representative to discuss your background and qualifications. (Include your address and phone number where you can be reached.)

F. Address letters of inquiry to the personnel manager unless you know his/her name

III. Information to include in a letter of application:

A. Specify the particular job you are applying for and your reason for interest in the position and company

B. Explain how your personal qualifications meet the needs of the employer

C. Explain how your work experience relates to the job requirements

D. Make mention of and include your resume

E. State your willingness and request for an interview. (Include your address and phone number where you can be reached.)

SAMPLE LETTER OF APPLICATION

702 Arapaho
Sevin, Illinois 60624
October 3, 1984

Joe Smith
Personnel Manager
Stillwater Country Club
1515 West Sixth Avenue
Sevin, Illinois 60624

Dear Mr. Smith:

Please consider me for the greensworker position which you advertised in the Sevin News Press.

The skills I have learned in my high school vocational agriculture courses should qualify me for this position. I have had experience in operating a power lawn mower, taking soil samples, and applying fertilizers.

This fall I will be enrolled in the cooperative vocational agriculture program at Metropolitan High School. I feel that the experiences gained in this program will help me to be a valuable addition to your firm. Mr. Charles Black will be my teacher-coordinator. A more complete description of my qualifications is given on the enclosed resume.

May I come for an interview at your convenience anytime after school? I can be reached by phone at 377-2000 after 3:30 p.m. or by mail at 702 Arapaho, Sevin, Illinois 60624.

Sincerely,

Pat Simmons

Pat Simmons

Enclosure

SAMPLE LETTER OF INQUIRY

702 Arapaho
Sevin, Illinois 60624

Mr. Earl Douglas, Manager
Frank's Nursery
Toledo, Ohio 43600

Dear Mr. Douglas:

In August I will be moving to the Toledo area where my father has accepted employment.

I will graduate from Lane High School on June 10. My grade point average is 4.15 on a 5 point system. I have taken vocational horticulture during my last two years in high school. My occupational experience program for the senior year consisted of working with sales and promotions at the Lake Michigan Nursery and Garden Center.

I will appreciate any information you can give regarding vacancies at Frank's Nursery. My telephone number is 854-3000. Thank you for your consideration.

Sincerely,

Pat Simmons

Pat Simmons

INFORMATION SHEET 4

MAKING APPOINTMENTS BY TELEPHONE

There will often be times when you will have to arrange an appointment to interview for a job by telephone. Certain procedures should be followed when making appointments. This call may be the first contact you have with the company. It is important to be polite and courteous, so that you make a good first impression. Remember that the receptionist is there to help you, so it is important to keep him/her on your side. Also, remember that it is not appropriate to ask about salary over the phone. Use the checklist below to help you properly make an appointment by telephone.

CHECKLIST FOR MAKING APPOINTMENTS BY TELEPHONE

1. Did you prepare a rough outline of what you wanted to cover before making the call? YES NO
2. Were you prepared before calling? YES NO
3. Did you have to pause and stammer to find the right words? YES NO
4. Did you immediately identify yourself? YES NO
5. Did you immediately state your reason for calling? YES NO
6. Did you ask when would be the best time for the employer to interview you? YES NO
7. Did you record the exact day, time and place of the interview? YES NO
8. Were you courteous and friendly? YES NO
9. Did you thank the receptionist for his/her help? YES NO

INFORMATION SHEET 5

QUESTIONS I SHOULD ASK DURING MY JOB INTERVIEW

When interviewing for a job you will probably have several questions to ask the interviewer. However, interviewers will often eliminate the need for asking some questions, due to the information they provide during the interview. While it is important to be prepared to ask questions yourself, you should wait to see how many questions are answered during the course of the interview. A list of appropriate questions to ask the interviewer is given below:

1. What are the typical working hours?
2. What will be the actual starting date for the job?
3. What are the specific job responsibilities?
4. Does the company offer a training program to allow employees to learn new skills?
5. Do employees specialize in a particular aspect of work for the business?
6. What is the established line of authority? Who would be my immediate supervisor?
7. Where exactly would I be working? What are the general working conditions?
8. What types of machinery, tools and equipment would I be operating?
9. Am I expected to supply any of my own tools? If so, what do I need to supply?
10. How much overtime is generally needed and expected?
11. What is the policy for promotions and raises?
12. What is the policy for vacation and sick leave?
13. What type of salary and fringe benefits can be expected? (Note: this question should be asked only toward the end of an interview. Many interviewers prefer to discuss salary and benefits only after you have been offered the job.)
14. When will I be contacted regarding your decision on filling the position?
15. Is this position filled on a year-round or seasonal basis?

INFORMATION SHEET 6

THE DO'S AND DON'T'S OF INTERVIEWING FOR JOBS

DO:

1. Find out about the company before you interview (its products, who its customers are, etc.).
2. Be neat and well-groomed, dress conservatively.
3. Be punctual (15-20 minutes early).
4. Have your resume and examples of your work available for quick reference.
5. Have a pen and note pad to take notes.
6. Have a prepared list of questions you are interested in regarding the job. (These may be answered by the interviewer during the course of the interview.)
7. When meeting the receptionist, smile, introduce yourself, state you have an appointment, follow the receptionist's instructions, and wait patiently.
8. Greet the interviewer with a smile and by name.
9. If the interviewer offers his/her hand, shake it firmly.
10. Introduce yourself and state the purpose of your appointment.
11. Be seated only after the interviewer has asked you to do so.
12. Sit and stand erect.
13. Be polite and courteous.
14. Be sincere, enthusiastic, friendly and honest.
15. Let the interviewer take the lead in the conversation.
16. Be alert (sit slightly forward in the chair to give an alert appearance).
17. Be confident, look directly at the interviewer.
18. Make an effort to express yourself clearly and distinctly.
19. Speak correctly, use proper grammar, speak in clear moderate tones.
20. Take time to think about your answer, choose words carefully.
21. Answer questions completely, but give only essential facts.

22. Convey positive answers.
23. Speak positively of former employers and associates.
24. Watch for signs that the interview is over such as interviewer shuffling papers, moving around in chair, etc.
25. Thank the interviewer for his/her time.
26. Shake hands with the interviewer and leave promptly at the completion of the interview.
27. Write a follow-up letter to express your interest in the job and your appreciation for the opportunity to interview.

DON'T:

1. Interview for a job unless you have a sincere interest in it.
2. Take others with you to the interview (parents, friends, etc.).
3. Put your hat or coat on the interviewer's desk.
4. Use a limp or overpowering handshake.
5. Lean against a wall, chair or desk.
6. Interrupt the interviewer.
7. Chew gum, smoke, eat candy.
8. Giggle, squirm in your chair, tap your fingers, swing a crossed leg, etc.
9. Use slang or swear.
10. Talk too long.
11. Try to flatter the interviewer.
12. Give all yes or no answers.
13. Talk about personal problems.
14. Press for a decision on being hired.

INFORMATION SHEET 7

NEGATIVE FACTORS OBSERVED DURING JOB INTERVIEWS[1]

1. Poor personal appearance
2. Aggressive, conceited, superiority complex, overbearing, know-it-all
3. Inability to express self clearly - poor voice diction and/or grammar
4. Lack of planning for career - no purpose or goals
5. Lack of interest and enthusiasm - passive, indifferent
6. Lack of confidence and poise - nervous, ill at ease
7. Failure to participate in activities
8. Overemphasis on money - interested only in best dollar offer
9. Poor scholastic record
10. Makes excuses and is evasive in answering questions
11. Lack of tact
12. Lack of maturity
13. Lack of courtesy - ill-mannered
14. Condemnation of past employers
15. Marked dislike for schoolwork
16. Lack of vitality
17. Fails to look interviewer in the eye
18. Limp, fishy handshake
19. Indecision
20. Sloppy letter of application, resume, or application form
21. Conveys feeling of merely shopping around
22. Wants job only for a short time
23. Lack of knowledge about field of specialization
24. No interest in the employer
25. Cynical personality
26. Obvious laziness
27. Intolerant, has strong prejudices
28. Inability to take criticism
29. Radical ideas
30. Late to the interview without good reason
31. Never heard of the employer (or grossly underinformed)
32. Asks no questions about the job or the employer
33. High pressure personality type
34. Asks questions that were answered in the literature the candidate already has
35. Talks too much or too little
36. Indefinite response to questions

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[1] The negative factors listed were taken from the pamphlet Making the Most of Your Job Interviews, published by the New York Life Insurance Company.

INFORMATION SHEET 8

LETTER TO JOB APPLICANTS[1]

Dear Job Applicant:

Today you asked me for a job. From the look of your shoulders as you walked out, I suspect you've been turned down before, and maybe you believe by now that people just out of high school can't find work.

But I did hire a teen-ager today. You saw him. He was the one with the polished shoes and a necktie. What was so special about him? Not experience; neither of you had any. It was his attitude. Yes, attitude! He wanted that job badly enough to look neat, and to look in the phone book to find out what this company does. He did his best to impress me. That's how he edged you out.

You see, people who hire people aren't "with" a lot of things. Some of us have what you may call Stone Age ideas about who owes whom a living. But there's nothing wrong with the checks we sign, and if you want one, you'd better tune in to our wave-length, too.

Ever hear of "empathy"? It's the trick of seeing the other fellow's side of things. I couldn't have cared less that you're behind in your car payments. That's your problem. What I needed was someone who'd go out into the plant, keep his eyes open, and work for me as if he were working for himself. If you have even the slightest idea of what I'm trying to say, let it show the next time you ask for a job. You'll be head and shoulders over the rest.

Look, the only time jobs grew on trees was while most of the manpower was wearing GI's and pulling KP. Maybe jobs aren't as plentiful right now as you'd like, but a lot of us can remember when master craftsmen were walking the streets. By comparison, you don't know the meaning of "scarce."

You may not believe it, but all around you are employers looking for young men and women smart enough to go after a job in the old-fashioned way. When they find one, they can't wait to unload some of their worries on him.

For both our sakes, get eager, will you?

Sincerely yours,

Prospective Employer

Prospective Employer

---

[1] The New Mexico Horticultural Core Curriculum was the source of the above letter.

INFORMATION SHEET 9

GUIDELINES FOR WRITING A FOLLOW-UP LETTER

Follow-up letters are sent immediately after you have had an interview. The follow-up letter demonstrates your knowledge of business etiquette and protocol. Always send a follow-up letter regardless of whether or not you had a good interviewing experience and regardless of whether you are no longer interested in this position. When employers do not receive follow-up letters from job candidates, they often assume the candidate is not aware of professional protocol they will need to demonstrate on the job.

The major purpose of a follow-up letter is to thank those individuals who participated in your interview. In addition, a follow-up letter reinforces your name, application and qualifications to the employer, and indicates whether you are still interested in the job position. The following list should be used as a guide when writing a follow-up letter.

1. Letters should include an expression of appreciation for the interviewer's time and interest in you as a candidate.
2. If you are no longer interested in the position indicate this as clearly and politely as you can. You may wish to indicate why you are no longer interested in the position (accepted a job elsewhere, decision to continue education). You are not required to provide a reason. However, it is polite and often helpful to employers to do so.
3. If you are interested in the position indicate this as clearly as you can. Summarize your qualifications. Re-emphasize your strengths as shown on your application letter and resume, plus any other strengths overlooked previously.
4. Letters should include your name, address, and phone number to make it easier for the employer to contact you.
5. Letters should be typed and error free.
6. Letters should be clean, neat, and arranged attractively on the paper.
7. Letters should be free from spelling, punctuation, and grammatical errors.
8. Letters should be proofread by you and another person before mailing.
9. Letters should be sent within a day or two after the interview.
10. A follow-up letter serves as a last bid for a job position. Make it a prime example of your excellent work habits. Be sure it is as clean, neat, and well-groomed as possible.

SAMPLE FOLLOW-UP LETTER

702 Arapaho
Sevin, Illinois 60624
October 8, 1984

Mr. Joe Smith
Personnel Manager
Stillwater Country Club
1515 West 6th
Sevin, Illinois 60624

Dear Mr. Smith:

Thank you for interviewing me for the greensworker position in your office. I feel that working for the Stillwater Country Club would be enjoyable and that I could do the maintenance and general lawn work which the position requires. I hope that I will have the opportunity to demonstrate my abilities.

The application form you gave me is enclosed.

I will be available for work October 10. You may call me at home after 3:30 p.m. The number is 377-2000.

Sincerely yours,

Pat Simmons

Pat Simmons

Enclosure

INFORMATION SHEET 10

FACTORS TO CONSIDER WHEN SELECTING A POST-SECONDARY SCHOOL

Many occupations in horticulture/agriculture require additional training beyond a high school diploma. Attending a post-secondary school can increase your choice of jobs and earning power, as well as provide expanded social, cultural, and leadership activities and experiences. Selecting a post-secondary school must be a personal decision based upon several important factors. The following list of questions should be considered when choosing a school. However, this is by no means a complete list of all factors to consider. Every individual has many personal and occupational concerns which will affect the type and importance of questions to ask.

1. What type of degree programs are offered in the area of horticulture and how long does it take to complete each of them?
2. What courses are required to complete each degree program offered in horticulture?
3. Will I have the flexibility to take courses that I am interested in other than horticulture?
4. Can I have a dual major or minor in another area of interest?
5. Is a work-experience period or internship required to obtain a degree?
6. What type of reputation does the school's horticulture program have?
7. What percentage of the students in horticulture find jobs within thirty days after graduation?
8. What services does the school provide to help me locate and secure a job after graduation?
9. Does the school offer any programs to help me gain work experience in horticulture before I graduate?
10. Are there any jobs or part-time work available in horticulture near the school?
11. How far away is the school located from my home?
12. In what type of community is the school located (urban, suburban, rural)?
13. How large is the school in terms of the student population?
14. What type of housing is available?
15. What is the estimated yearly cost of attending the school (tuition, fees, housing, books, etc.)?

INFROMATION SHEET 10 - Continued

16. What types of scholarships, grants, or loans are available to assist in the cost of attending the school?

17. What type of student activities are available outside the classroom which relate to horticulture.

18. What type of recreational activities are available?

19. Are there programs available so I can pursue my interests and hobbies (e.g., music, sports, crafts)?

20. What other services are available to help me adjust and be a successful student (e.g., reading, writing and study skills workshops, academic, career and personal counseling services, libraries, etc.)?

STUDENT WORKSHEET 1

COMPARING OCCUPATIONAL CHOICES

Using information you gathered about three occupations of your choice and characteristics about yourself, compare the characteristics required by the occupation and those you possess by answering YES or NO to the following questions.

NAME OF OCCUPATION	1.________	2.________	3.________
1. Does the job description fit your interests?	________	________	________
2. Is this the level of occupation in which you wish to engage?	________	________	________
3. Does this type of work appeal to your interests?	________	________	________
4. Are the working conditions suitable to you?	________	________	________
5. Will you be satisfied with the salaries and benefits offered?	________	________	________
6. Can you advance in this occupation as rapidly as you would like?	________	________	________
7. Does the future outlook satisfy you?	________	________	________
8. Is there enough demand for this occupation that you should consider entering it?	________	________	________
9. Do you have or can you get the education needed for the occupation?	________	________	________
10. Can you get the finances needed to get into the occupation?	________	________	________
11. Can you meet the health and physical requirements?	________	________	________
12. Will you be able to meet the entry requirements?	________	________	________
13. Are there any other reasons you might not be able to enter this occupation?	________	________	________

STUDENT WORKSHEET 1 - Continued

14. Is the occupation available locally or are you willing to move to a part of the country where it is available?	________	________	________
15. Does the occupation require special licensing or certification?	________	________	________

STUDENT WORKSHEET 2

EVALUATING MY CAREER GOALS

Name of Occupation

Part I ____________________

Duties of the Worker

Job	Daily	Weekly	Monthly

Personal Requirements

Age Range: ____________

Interests and abilities needed:

____

____

____

Personality and physical requirements:

____

____

____

____

Educational Requirements

Recommended high school program:

____

____

Post-high school education required or recommended (trade school, college apprenticeship, on-job-training)

Advantages and Disadvantages

(Earnings, hours, conditions, security of employment, opportunity for advancement)

Advantages: ____________

____

____

____

Disadvantages: ____________

____

____

____

Present Demand & Future Outlook

Number of workers: Nat'l ________

State ________ Local ________

Present need for workers:
Great ____ Moderate ____ Slight ____

Probable future trend: Little change ________ Increasing need ________

Decreasing need ________

Are jobs confined to certain areas?

Yes ________ No ________

Entering the Occupational Area

Any special entrance requirements (minimum education, entrance exams, experience, capital, licensing, union)

____

____

Sources of additional information

____

____

STUDENT WORKSHEET 2 - Continued

Part II

Now that you have information on an occupation in which you are interested, it is time to identify and develop a short term career plan. In the space below identify essential school courses or special training which you need to obtain before you are qualified for employment. Also identify essential skills or competencies needed in this occupation. Place an "X" by those areas you have already mastered.

Occupation: Flower Shop Manager

Formal Courses/Special Training		Essential Competencies	
Example: Floral design	X	Designing corsages	X
Business Management		Purchasing supplies	
		Determining prices	
		Training employees	

Briefly explain how the FFA and your S.O.E.P. can be used to accomplish essential job competencies.

Example: A. I will participate in the FFA Floral Design Contest.
B. I will be working in a retail flower shop to gain experience as well as business management skills.

STUDENT WORKSHEET 3

EVALUATING MY PERSONAL APPEARANCE, FEELINGS AND HABITS

DIRECTIONS: Answer the following questions by circling "A" for Always, "U" for Usually, "S" for Sometimes, or "N" for Never. Review your answers to determine which areas you need to improve.

PART I: PERSONAL APPEARANCE

1.	Are you aware that personal cleanliness and neatness have an effect on those around you?	A	U	S	N
2.	Do you bathe at least once daily and after strenuous exercise?	A	U	S	N
3.	Do you use an effective deodorant daily?	A	U	S	N
4.	Do you brush your teeth at least twice daily?	A	U	S	N
5.	Do you keep your hair clean and well-groomed?	A	U	S	N
6.	Do you wear clothes that are becoming to you and appropriate to the occasion?	A	U	S	N
7.	Are your clothes neat and clean?	A	U	S	N
8.	Do you keep your weight at the pound recommendation for your height and body frame?	A	U	S	N
9.	Do you eat a well-balanced diet each day?	A	U	S	N
10.	Do you exercise regularly?	A	U	S	N
11.	Do you get enough sleep each night?	A	U	S	N
12.	Do you maintain straight, correct posture when sitting, standing and walking?	A	U	S	N

PART II: WORKING WITH OTHERS

1.	If someone asks you for help, do you give it cheerfully?	A	U	S	N
2.	Do you laugh at the mistakes of others?	A	U	S	N
3.	Is it easy for you to praise and compliment other people?	A	U	S	N

4.	Do you enjoy gossip?	A	U	S	N
5.	Do you feel awkward around strangers?	A	U	S	N
6.	Are you able to ask others for help when you need it?	A	U	S	N
7.	Do you try to see the other person's point of view?	A	U	S	N
8.	Do others enjoy being around you?	A	U	S	N
9.	Do you take a sincere interest in those around you?	A	U	S	N
10.	Can you offer constructive criticism in a polite manner?	A	U	S	N
11.	Do you congratulate your friends upon their achievements?	A	U	S	N
12.	Do you enjoy being part of a group?	A	U	S	N
13.	Do you make friends easily?	A	U	S	N
14.	Are you thoughtful of the feelings of others?	A	U	S	N
15.	Do you get along well with others?	A	U	S	N
16.	Do people ask for your advice?	A	U	S	N
17.	Does conversation stop when you join a group?	A	U	S	N
18.	Do you sense that others feel uncomfortable around you?	A	U	S	N
19.	Do you keep the promises you make to others?	A	U	S	N
20.	Do you easily become jealous of others?	A	U	S	N

PART III: COMMUNICATION SKILLS

1.	Do you organize your thoughts and ideas before you speak?	A	U	S	N
2.	Do you concentrate on the meaning you are trying to convey?	A	U	S	N

3. Do you make grammatical and spelling errors when speaking or writing? A U S N

4. When you are listening to someone, are you easily distracted by outside sights and sounds? A U S N

5. Do you use clear, distinct speech? A U S N

6. Do you have a pleasant speaking voice? A U S N

PART IV: PERSONAL FEELINGS AND ATTITUDES

1. Do you try to have a positive attitude? A U S N

2. Do you approach your work confidently? A U S N

3. Are you willing to accept responsibility? A U S N

4. Are you able to act naturally under all circumstances? A U S N

5. Do you worry about past mistakes and failures? A U S N

6. Do you control your temper? A U S N

7. Are you able to make decisions about everyday things easily? A U S N

8. Are you able to keep your personal troubles to yourself? A U S N

9. Do you react constructively to criticism? A U S N

10. Do you accept blame for things that are your fault? A U S N

11. Do you tell the truth and are you sincere? A U S N

12. Are you easily discouraged? A U S N

13. Can you adapt to all situations? A U S N

14. Do you persevere until you achieve success? A U S N

15. Can you make decisions quickly and accurately? A U S N

16. Are you afraid to express your opinions and ideas? A U S N

17. Are you ambitious? A U S N

18. Do you complain when things don't go the way you'd like? A U S N

19. Do you become impatient with yourself and others? A U S N

20. Do you feel you are a unique and valuable person? A U S N

PART V: PLANS FOR IMPROVEMENT

1. What do you feel are your strengths regarding personal appearance, feelings and habits?

2. What do you feel are your weaknesses regarding personal appearance, feelings and habits?

3. In what ways do you want to change or improve your personal appearance, feelings and habits?

4. Now that you have decided what to improve about yourself, you must decide how you can make the improvements. One way is to develop a self-improvement plan of action with a reward/penalty system. For example, you may decide you need to spend more time studying. Your plan of action may be to study 2 hours each day after school. If you study for 2 hours, reward yourself with a pleasurable activitiy such as watching TV, playing a game of basketball, eating a piece of cake, etc. If you do not study, you must give up one of the pleasurable activities you had planned to do. Complete the section on the next page to begin your self-improvement plan.

STUDENT WORKSHEET 3 - Continued

SELF-IMPROVEMENT PLAN

NAME ______________________________ DATE ______________

I do hereby agree to ______________________________

______________________________ (activity or behavior)

for a period of ________ (number) days. In return I will receive the rewards listed below.

REWARD ______________________________

____

If I fail to live up to this self-improvement plan, the following penalties will take effect:

PENALTIES ______________________________

____

SIGNATURE ______________________________

STUDENT WORKSHEET 4

SELF-IMPROVEMENT: DO YOU SEE YOURSELF AS OTHERS SEE YOU?

DIRECTION: Before you can project personal characteristics necessary for gaining employment, you must determine if you possess them. It is important that you evaluate yourself truthfully so you can improve your personality. Rate yourself on the following scale by marking either "A" for Always, "U" for Usually, "S" for Sometimes or "N" for Never. Have a friend or relative rate you as they see you. Compare your answers to determine those areas needing improvement.

DESIRABLE CHARACTERISTICS

1.	Accurate	A	U	S	N
2.	Agreeable	A	U	S	N
3.	Ambitious	A	U	S	N
4.	Appreciative	A	U	S	N
5.	Attentive	A	U	S	N
6.	Broadminded	A	U	S	N
7.	Cheerful	A	U	S	N
8.	Confident	A	U	S	N
9.	Conscientious	A	U	S	N
10.	Considerate	A	U	S	N
11.	Cooperative	A	U	S	N
12.	Courteous	A	U	S	N
13.	Creative	A	U	S	N
14.	Dependable	A	U	S	N
15.	Efficient	A	U	S	N
16.	Enthusiastic	A	U	S	N
17.	Friendly	A	U	S	N
18.	Good Natured	A	U	S	N
19.	Honest	A	U	S	N
20.	Leadership Qualities	A	U	S	N
21.	Loyal	A	U	S	N
22.	Mature	A	U	S	N
23.	Modest	A	U	S	N
24.	Obedient	A	U	S	N
25.	Optimistic	A	U	S	N
26.	Patient	A	U	S	N
27.	Perseverant	A	U	S	N
28.	Poised	A	U	S	N
29.	Positive	A	U	S	N
30.	Practical	A	U	S	N
31.	Punctual	A	U	S	N
32.	Realistic	A	U	S	N
33.	Reasonable	A	U	S	N
34.	Resourceful	A	U	S	N
35.	Self-conscious	A	U	S	N
36.	Self-control	A	U	S	N
37.	Self-starting	A	U	S	N

38.	Sense of humor	A	U	S	N
39.	Sensible	A	U	S	N
40.	Sincere	A	U	S	N
41.	Sympathetic	A	U	S	N
42.	Tactful	A	U	S	N
43.	Thoughtful	A	U	S	N
44.	Tolerant	A	U	S	N
45.	Trustworthy	A	U	S	N

UNDESIRABLE CHARACTERISTICS

1.	Apathetic	A	U	S	N
2.	Argumentative	A	U	S	N
3.	Artificial	A	U	S	N
4.	Boastful	A	U	S	N
5.	Conceited	A	U	S	N
6.	Critical	A	U	S	N
7.	Deceitful	A	U	S	N
8.	Defensive	A	U	S	N
9.	Domineering	A	U	S	N
10.	Emotional	A	U	S	N
11.	Forgetful	A	U	S	N
12.	Greedy	A	U	S	N
13.	Impulsive	A	U	S	N
14.	Inferiority Complex	A	U	S	N
15.	Inhibited	A	U	S	N
16.	Irritable	A	U	S	N
17.	Jealous	A	U	S	N
18.	Militant	A	U	S	N
19.	Moody	A	U	S	N
20.	Pessimistic	A	U	S	N
21.	Rebellious	A	U	S	N
22.	Restless	A	U	S	N
23.	Rude	A	U	S	N
24.	Sarcastic	A	U	S	N
25.	Selfish	A	U	S	N
26.	Shrewd	A	U	S	N
27.	Stubborn	A	U	S	N
28.	Sulky	A	U	S	N
29.	Timid	A	U	S	N
30.	Vicious	A	U	S	N

STUDENT WORKSHEET 5

PERSONAL DATA SHEET

NAME ____

ADDRESS ____

PHONE NUMBER ____

EDUCATION:

HIGH SCHOOL ____

MAJOR COURSES ____

____

TECHNICAL SKILLS ____

____

LEADERSHIP ACTIVITIES ____

____

____

HONORS AND OTHER ACCOMPLISHMENTS ____

____

WORK EXPERIENCE: (Briefly list jobs held, employers' names and addresses, and length of service for each. Begin with present or last job first.)

____

____

____

____

____

REFERENCES: (Include complete name, title, address, and phone numbers.)

____

____

____

____

STUDENT WORKSHEET 6

COMPLETING A JOB APPLICATION FORM

When completing a job application, remember you are trying to sell yourself by the information given. Review the entire application form before you begin. Pay particular attention to any special instructions to print or write in your own handwriting. The following guidelines will provide you some direction when completing application forms. After you review these guidelines complete the sample application form attached.

1. Follow all instructions carefully and exactly.
2. If hand-written, rather than typed, write neatly and legibly. Hand-written answers should be printed unless otherwise directed.
3. Application forms should be written in ink unless otherwise requested. If you make a mistake, mark through it with one neat line.
4. Be honest and realistic.
5. Give all the facts for each question.
6. Keep answers brief.
7. Fill in all blanks. If the question does not pertain to you, write "not applicable" or "N/A". If there is no answer write "none" or draw a short line through the blank.
8. Many application forms ask what salary you expect. If you are not sure what is appropriate write "negotiable," "open," or "scale" in the blank.
9. Write the complete names, titles, addresses, and phone numbers of all references and former employees when completing the application form.
10. Make sure you have included any of your special abilities and accomplishments.
11. Upon completing the application form, check for completeness, accuracy, and correct spelling.
12. Have another person proofread the form before submitting it.

APPLICATION FOR EMPLOYMENT

PERSONAL INFORMATION

Date

NAME Last First Middle

PRESENT ADDRESS Street City State Zip

PERMANENT ADDRESS Street City State Zip

PHONE NO. SOCIAL SECURITY NUMBER

REFERRED BY

Last First Middle

EMPLOYMENT DESIRED

POSITION DATE YOU CAN START SALARY DESIRED

ARE YOU EMPLOYED NOW? IF SO MAY WE INQUIRE OF YOUR PRESENT EMPLOYER

EVER APPLIED TO THIS COMPANY BEFORE? WHERE WHEN

EDUCATION	NAME AND LOCATION OF SCHOOL	YEARS ATTENDED	DATE GRADUATED	SUBJECTS STUDIED
GRAMMAR SCHOOL				
HIGH SCHOOL				
COLLEGE				
TRADE, BUSINESS OR CORRESPONDENCE SCHOOL				

SUBJECTS OF SPECIAL STUDY OR RESEARCH WORK

U.S. MILITARY OR NAVAL SERVICE RANK PRESENT MEMBERSHIP IN NATIONAL GUARD OR RESERVES

ACTIVITIES OTHER THAN RELIGIOUS (CIVIC, ATHLETIC, FRATERNAL, ETC.)
Exclude organizations, the name or character of which indicates the race, creed, color or national origin of its members.

(CONTINUED ON OTHER SIDE)

M-III-A-1-40

FORMER EMPLOYERS (List below last four employers, starting with last one first.)

DATE MONTH AND YEAR	NAME AND ADDRESS OF EMPLOYER	SALARY	POSITION	REASON FOR LEAVING
From				
To				
From				
To				
From				
To				
From				
To				

REFERENCES: Give below the names of two persons not related to you whom you have known at least one year.

NAME	ADDRESS	BUSINESS	YEARS ACQUAINTED
1.			
2			

PHYSICAL RECORD:

List any physical defects

WERE YOU EVER INJURED? GIVE DETAILS

HAVE YOU ANY DEFECTS IN HEARING? IN VISION? IN SPEECH?

IN CASE OF EMERGENCY NOTIFY

Name Address Phone No.

I AUTHORIZE INVESTIGATION OF ALL STATEMENTS CONTAINED IN THIS APPLICATION. I UNDERSTAND THAT MISREPRESENTATION OR OMISSION OF FACTS CALLED FOR IS CAUSE FOR DISMISSAL. FURTHER, I UNDERSTAND AND AGREE THAT MY EMPLOYMENT IS FOR NO DEFINITE PERIOD AND MAY, REGARDLESS OF THE DATE OF PAYMENT OF MY WAGES AND SALARY BE TERMINATED AT ANY TIME WITHOUT ANY PREVIOUS NOTICE.

DATE SIGNATURE

DO NOT WRITE BELOW THIS LINE

TO BE COMPLETED DAY EMPLOYMENT BEGINS

DATE

HEIGHT WEIGHT AGE DATE OF BIRTH

SINGLE MARRIED WIDOWED CITIZEN U.S.A. SEX

The above information needed for pension, hospitalization insurance, etc., and not for hiring purposes.

INTERVIEWED BY DATE REMARKS

NEATNESS		CHARACTER	
PERSONALITY		ABILITY	

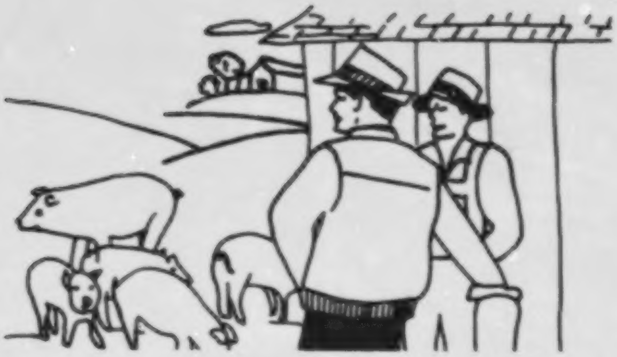
HIRED FOR DEPT. POSITION WILL REPORT SALARY WAGES

APPROVED: 1 2. 3.

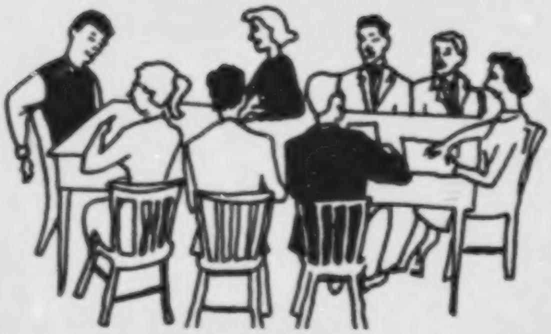
Employment Manager Dept. Head General Manager

M-III-A-1-41

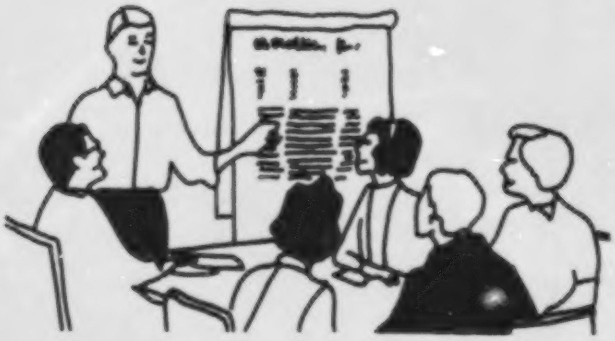
Skills Needed By Workers



Human Relation Skills



Organizational Skills



Coping Skills

Basic Occupational Skills Employers Want

Competencies	Activities which will develop these areas
1. Punctuality	1.
2. Dependability	2.
3. Getting along with others	3.
4. Working as a team member	4.
5. Organizing the work activities of others	5.
6. Understanding written information	6.
7. Basic writing skills	7.
8. Basic speaking skills	8.
9. Being neat and clean in appearance	9.
10. Maintaining good health	10.
11. Knowing your strengths and weaknesses	11.
12. Giving an honest day's work	12.
13. Loyalty to your organization	13.
14. Making independent decisions	14.

Basic Occupational Skills Employers Want continued

Competencies	Activities which will develop these areas
15. Using initiative and imagination	15.
16. Knowing what is expected	16.
17. Basic arithmetic skills	17.
18. Knowing how to use materials and equipment	18.
19. Locating information	19.
20. Having specialized training	20.
21. Knowledge of operating procedures	21.
22. Following instructions	22.
23. Working without close supervision	23.
24. Working under pressure	24.
25. Adjusting to work situations	25.
26. Managing time and materials effectively	26.
27. Following safety regulations	27.

Sources for Locating Jobs

1. Newspapers – classified advertisement section
2. Magazines or trade journals and publications
3. Local labor union business offices
4. Personal contacts
    - A. Friends
    - B. Relatives
    - C. Teachers
    - D. School guidance counselors
    - E. Employees of a company you are interested in
5. Placement offices
    - A. Public
    - B. Private
    - C. School
6. Employment or personnel office of company
7. Public notices – window signs in business

TRANSPARENCY DISCUSSION GUIDE

GAINING EMPLOYMENT

I. Transparency: SKILLS NEEDED BY WORKERS

A. Discuss the following ideas regarding the three general categories of job skill.

1. Human relations:

   a. Basic to all human interactions.

   b. Most frequent cause of conflict and job dissatisfaction.

   c. Human behavior affects productivity.

   d. Effective human relations can be developed and improved.

2. Organizational skills:

   a. Important to understand why people work.

   b. Important to understand the factors which motivate people to do their best work.

   c. Creativity, problem solving, and decision making are important occupational skills.

3. Coping skills:

   a. Ability to solve unexpected or difficult problems which are mutually acceptable to the involved parties.

   b. Ability to anticipate future trends in job demands.

B. Discuss the importance of the three categories to job satisfaction and their relation to job promotion.

II. Transparency: BASIC OCCUPATIONAL SKILLS EMPLOYERS WANT

A. Have students review the items and identify where they could receive training on each skill (such as FFA, S.O.E., on-the-job, laboratory, etc.)

B. Divide the class into three groups and have each group "rank order" their nine items on importance to job success using their personal opinions. Let each group discuss their rankings with the rest of the class.

C. Identify the top ten items by combining the three groups top rankings.

D. Compare and discuss their ranking with those below which were completed by secondary school personnel, students, and parents.

Overall Ranking		Individual Group Ranking		
		Secondary School Personnel	Students	Parents
1	Have basic speaking skills	1	1	1
2	Have basic arithmetic skills	2	3	2
3	Use initiative and imagination	3	2	3
4	Know what an employer expects	12	4	5
5	Get along with a variety of people	4	5	9
6	Be dependable	5	6	6
7	Maintain good health	11	7	7
8	Have basic writing skills	7	9	4
9	Be punctual	6	8	8
10	Manage time and materials efficiently	19	11	12
11	Work as a team member	9	13	11
12	Work under tension or pressure	16	10	13
13	Adapt to varying work situations	8	12	10
14	Organize work activities of others	17	15	14
15	Use information, materials, equipment	10	14	15
16	Follows instructions	14	17	17
17	Follow safety regulations	13	18	16
18	Be loyal to employer	15	16	19
19	Work without close supervision	18	19	20
20	Make decisions on your own	20	20	18
21	Be neat and clean in appearance	21	21	21

III. Transparency: SOURCES FOR LOCATING JOBS

A. Discuss the various methods that can be used to locate jobs such as personal contacts, newspaper ads, etc.

1. Local labor union business offices can provide information on apprenticeship programs.

2. Interviewing several groups of people already working for a company you are interested in helps provide information about the company.

3. Public notices located in post offices can provide information such as federal civil service jobs.

B. Placement offices provide vocational counseling, give aptitude and ability/interest tests, locate jobs, and arrange job interviews. There are three types of placement offices - public, private and school.

1. Public - supported by federal and state funds, services are free, contact State Employment Commission.

2. Private - charge for services provided usually a percentage of your beginning salary, must sign a contract before they provide services, many specialize in only one occupational area.

3. School - high schools, trade schools, and colleges provide vocational services for their students.

SAMPLE TEST QUESTIONS AND TEACHER'S KEY

GAINING EMPLOYMENT

1. Match the desirable employee characteristics on the right to the correct definitions. Place the appropriate numbers in the blanks provided.

_F_ 1. Working in harmony with others
_D_ 2. Being truthful in all things
_B_ 3. Being eager to help or to take part in some activity
_G_ 4. Adjusting easily to new situations
_K_ 5. Being able to say the right thing at the right time
_I_ 6. Taking time to do things right
_A_ 7. Doing what one has said will be done and completing duties and assignments
_C_ 8. Doing things without being told
_E_ 9. Being able to keep confidences and avoid gossip about work matters
_H_ 10. Being polite and acting with good manners
_J_ 11. Being able to control one's temper and emotions

A. Dependability
B. Enthusiasm
C. Initiative
D. Honesty
E. Loyalty
F. Cooperation
G. Adaptability
H. Courtesy
I. Patience
J. Self control
K. Tact
L. Cheerfuly
M. Punctual

2. List four means of locating job openings.

1. newspapers and magazines
2. state employment offices
3. personal contacts (friends, relatives)
4. teacher, school counselor

4. Select five personal attributes or attitudes that employers look for.

_A_ 1.
_C_ 2.
_D_ 3.
_F_ 4.
_G_ 5.

A. Alertness
B. Long wavy hair
C. Dedication and dependability
D. Enthusiasm and interest
E. New car
F. Honesty and integrity
G. Desire to work
H. Beard
I. Flashy clothes

5. Select 8 items of information that may be asked for on an employer's application blank.

B 1.
C 2.
F 3.
H 4.
K 5.
L 6.
N 7.
O 8.

A. Race
B. Name and address
C. Phone number
D. Shoe size
E. Age
F. Education
G. Number of brothers and sisters
H. Experience
I. Next of kin
J. Make and model of car
K. Previous employers
L. Reasons for leaving last job
M. Are you left or right handed?
N. Type of job for which one is applying
O. References

6. Identify ten examples of proper conduct during an interview.

B 1.
D 2.
F 3.
H 4.
I 5.
K 6.
L 7.
M 8.
O 9.
Q 10.

A. Arrive five minutes late gives the impression that one is busy.
B. Sit and stand erect.
C. Call interviewer by his or her first name.
D. Answer questions completely
E. Put a hat or coat on the interviewer's desk
F. Greet interviewer with a warm smile.
G. Sit down immediately upon entering room.
H. Shake the interviewer's hand firmly.
I. Be polite and courteous.
J. Use all of the cute slang expressions.
K. Look the interviewer in the eye.
L. Be sincere and enthusiastic.
M. Thank the interviewer for his time.
N. Chain smoke (gives the impression of being a real "he man.")
O. Speak well of former employers.
P. Flatter the interviewer.
Q. Leave promptly at completion of interview.

UNIT B: SUPERVISED OCCUPATIONAL EXPERIENCE

PROBLEM AREA: EVALUATING SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAMS AND ANALYZING STUDENT RECORDS

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with students enrolled in at least the second year of an agricultural/horticultural occupations program. The recommended time for teaching this problem area is January, with an instructional period of 5-7 days.

The instructional materials included in this problem area have been developed based on the following assumptions:

1. All students have conducted a supervised occupational experience program for one complete calendar year.
2. The teacher has provided class time for students to update record books on a regular basis throughout the school year.
3. The teacher has made visits to the occupational experience site of each student.

If these assumptions have not been met, the teacher will have to adapt this problem area to meet the needs of individual students. For example, many students are enrolled in horticultural classes for only one school year and have participated in a S.O.E.P. for 6-9 months. In this case the teacher may wish to utilize information sheets and student worksheets which emphasize the evaluation of personal growth and development rather than those emphasizing financial summaries.

F.F.A. proficiency awards are an excellent motivational tool to encourage students to complete records on a regular basis. Teachers should increase their own awareness of sectional and state awards through participation in their professional teaching organizations. Other suggestions to motivate students are included in the teacher's guide.

CREDIT SOURCES:

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The teacher's guide, information sheets, and student worksheets were developed by Susie Osborne, Department of Vocational and Technical Education, University of Illinois. Transparency masters were prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Metropolitan Core Curriculum Field Test Teachers.

TEACHER'S GUIDE

I. Unit: Supervised occupational experience

II. Problem area: Evaluating supervised occupational experience programs and analyzing student records

III. Objectives: At the close of this problem area, students will be able to:

1. Summarize their S.O.E.P. record book
2. Calculate their financial statement (total assets, total liabilities, net worth, change in net worth)
3. Analyze their records
4. Make plans to improve and expand their S.O.E.P.
5. Evaluate their personal development (human relations and communication skills) and occupational/educational goals.

IV. Suggested interest approaches:

1. Collect student record books prior to teaching this problem area. Place play money in the record books. Pass record books out to students at beginning of class. Ask students why they might find money in a record book. Point out that summarizing records will show them how much money they have earned and analyzing records will help them decide how to invest their earnings.
2. Have students briefly summarize the status of their S.O.E.P. and how they plan to improve it. Have other students give suggestions on how the S.O.E.P. could be improved.
3. Bring in a former star agribusiness person to discuss his or her award-winning S.O.E.P.

V. Anticipated problems and concerns of students:

1. Why should I summarize and analyze my S.O.E.P. records?
2. How do I "close out" my record book?
3. How do I determine my assets, liabilities, net worth and change in net worth?
4. What factors should I consider when evaluating my S.O.E.P.?
5. How can my S.O.E.P. be changed and/or improved?

VI. Suggested learning activities and experiences:

1. Conduct an interest approach using one or more of the suggestions in Section IV.
2. Have the class identify their problems and concerns. Record them on the chalkboard to stimulate their thinking and to use as a basis for teaching the problem area.
3. Show the film S.O.E. Bridging the Gap. Use the film as a review of the purposes of S.O.E.P.
4. Review with students the important reasons for keeping records. Ask the students which reasons will not apply if records are not summarized and analyzed. Show S.O.E. Transparency--Reasons For Summarizing and Analyzing Agricultural Business Records.
5. Distribute and discuss Information Sheet 1--Record Keeping - Definition of Terms.
6. Distribute Student Worksheet 1--My Financial Statement. Distribute 3 blank copies of the financial statement to each student. Work Problem 1 using S.O.E. Transparency--My Financial Statement--to show the students how a financial statement is completed. Have students copy this information on a blank financial statement. Have students complete Problem 2 and 3 as a homework or in-class assignment.
7. Group students according to the type of record books they have been using (e.g., Floriculture, Nursery Operations, Fruit or Vegetable Production). Provide to the appropriate group S.O.E. Student Worksheets 2, 3, 4, or 5 listing the record book pages that need to be completed. Allow class time for students to update their record books. Provide samples of completed record books of former students to use as references. Provide individualized instruction and advice as students complete their record books.
8. Distribute and discuss Information Sheet 2--Factors to Consider When Evaluating S.O.E. Programs. Teachers may wish to grade students on written answers to the questions listed on this information sheet.
9. Review and analyze records of former vocational agriculture students, including foundation award winners and state degree recipients. Identify those practices which make these former students' S.O.E. programs successful. Have students write a one-page paper explaining how they can incorporate these practices in improving and expanding their own S.O.E.P.
10. Have students complete Student Worksheet 6--Evaluating the Supervised Occupational Experience Program. The teacher should discuss with each student on an individual basis ways to help them increase their knowledge for those items not marked "strongly agree".

11. Have students complete the narration page in the back of their S.O.E.P. record book. Distribute Information Sheet 3 and discuss these guidelines for completing the narration. Have students write their narrations as homework or an in-class assignment.

12. Motivate students throughout the school year to improve and expand their S.O.E.P. by using some of the following techniques:

    a. Select an S.O.E.P. of the month, semester, etc. Display pictures of the student's program on a special bulletin board.

    b. Report to the class any special awards or progress students have made in improving and expanding their S.O.E.P.

    c. Select a Superior S.O.E.P. of the year for each class and award prizes to these students at a parent-member banquet.

    d. Prepare news articles on superior S.O.E. programs for the school and local papers.

    e. Show slides of superior S.O.E. programs at a parent-member banquet, horticultural trade show, local fairs and shows, etc.

    f. Devise a point-award system to reward students as they complete various aspects of their S.O.E.P.

VII. Application procedures:

1. Students will be able to apply for FFA foundation awards.

2. Students will be able to apply for FFA degrees.

3. Students will know if their S.O.E.P. has been a profitable venture as well as the reasons why.

4. Students will know how to improve their S.O.E.P.

5. Students will know whether to expand their S.O.E.P. based upon the summary and analysis of their records.

6. Every student cannot be a FFA foundation award winner. However S.O.E.P. achievement certificates are available from the National FFA Supply Service verifying that the student has successfully completed an S.O.E.P. These certificates can be distributed at the annual parent-member banquet.

7. Students will be able to deal with personal and business record keeping situations throughout their lifetime.

VIII. Evaluation:

1. Grade student worksheets included in this problem area.

2. Evaluate and grade students' S.O.E.P. record books.

3. Evaluate student progress on an individual basis by visitation to their actual S.O.E.P. site. Personal observation, talking to parents, employers, and the student will enable the teacher to determine if the student is obtaining a satisfactory occupational experience.

4. Evaluate individual S.O.E. programs for chapter awards.

IX. References and aids:

1. Film SOE - Bridging the Gap available on free loan from Vernard Films, Peoria, Illinois 61601, or can be purchased from:

   The National Supply Service
   National FFA Center
   5632 Mt. Vernon Memorial Highway
   P.O. Box 15160
   Alexandria, VA 22309

3. S.O.E.P. Record Books available from Vocational Agriculture Service, 1401 South Maryland Drive, Urbana, Illinois 61801:

   Fruit or Vegetable Production Record Book
   Floriculture Record Book
   Nursery Operations Record Book
   Turf and Landscape Management Record Book

4. Supervised Occupational Experience Handbook available from:

   The National Supply Service
   National FFA Center
   5632 Mt. Vernon Memorial Highway
   P.O. Box 15160
   Alexandria, VA 22309

5. Selected information sheets

6. Selected student worksheets

7. Selected transparencies

INFORMATION SHEET 1

RECORD KEEPING - DEFINITION OF TERMS

1.	ASSETS	Items or resources owned
2.	LIABILITIES	Financial claims against an individual or firm (debts)
3.	NET WORTH STATEMENT	Written statement listing the assets and liabilities of an individual or firm
4.	CHANGE IN NET WORTH	Differences between your net worth at the beginning of the year and the end of the year
5.	ENDING INVENTORY	Value of items you own or owned in partnership at the end of your S.O.E.P.
6.	TAKE HOME PAY	Total income received (Gross pay minus deductions such as social security, income taxes, et cetera)
7.	GROSS PAY	Total income earned

INFORMATION SHEET 2

FACTORS TO CONSIDER WHEN EVALUATING S.O.E. PROGRAMS

1. Evaluation should begin as soon as the S.O.E.P. begins and continue throughout the year, rather than just at the end of each year.

2. S.O.E. programs must be evaluated in terms of the total agriculture program, including class instruction, lab instruction and F.F.A. participation.

3. Evaluation should be done by the student, teacher, employer, parent and others directly involved in the S.O.E.P. Consider the following questions.

   A. Was the S.O.E.P. well planned?

   B. Was a budget developed and was the S.O.E.P. economically sound?

   C. Was a written training agreement and training plan developed and utilized?

   D. What were the strengths of the S.O.E.P.?

   E. What were the weaknesses of the S.O.E.P.?

   F. Were neat, accurate records maintained throughout the year?

   G. Were the following skills or competencies developed:

      * managerial abilities
      * oral and written communication skills
      * human relations skills
      * leadership skills, and
      * horticultural occupations skills?

   H. What were the major accomplishments of your S.O.E.P.?

   I. Did your S.O.E.P. relate to your educational and occupational goals?

   J. Did you apply what you learned in horticultural class and lab to your S.O.E.P.?

   K. Was having an S.O.E.P. interesting, educational and enjoyable?

   L. Did you take advantage of opportunities to improve and/or expand your S.O.E.P. throughout the year?

INFORMATION SHEET 3

GUIDELINES FOR COMPLETING THE RECORD BOOK NARRATION

The Record Book Narration provides you with the opportunity to discuss various aspects of your supervised occupational experience program which standard records do not show. For example, your total net profit may only be $15.20. However, the experience and knowledge you gained from your S.O.E.P. would be worth much more than $15.20.

It is suggested that you prepare a rough draft for your teacher to read before entering your final narration in your record book. When preparing your narration you should include the information given below.

I. Brief description of your S.O.E.P., including the reasons you selected the type of program you did

II. What goals you established for your S.O.E.P. and which goals were achieved

III. Management decisions you had to make in regard to your S.O.E.P.

IV. Knowledge gained--what you learned

V. Major accomplishments of your S.O.E.P.

VI. Analysis of S.O.E.P.--strengths and weaknesses--include answers to evaluation factors listed in Information Sheet 2--Factors to Consider When Evaluating S.O.E. programs

VII. Ways to improve and/or expand your S.O.E.P.

VIII. Manner in which your S.O.E.P. increased your awareness of horticultural careers and related to your occupational and educational goals

STUDENT WORKSHEET 1

MY FINANCIAL STATEMENT

The purpose of completing a financial statement is to determine your total net worth. By comparing your net worth at the end of the year with your net worth at the beginning of the year, you can tell whether business assets have grown or decreased. This will help you analyze your S.O.E.P. and make better business decisions.

DETERMINING NET WORTH

To determine your net worth you must first total all your assets and liabilities. Total net worth equals total assets minus total liabilities. Change in net worth equals net worth at the beginning of the year minus net worth at the end of the year.

PROBLEM 1: Linda has a landscape and turf project. The following is a list of her beginning and ending assets and liabilities. Determine her beginning and ending net worth and her change in net worth.

Assets at the beginning of the year:
Cash on hand, $25.00; cash in checking account, $50.00; cash in savings account, $125.00; life insurance (cash value), $50.00; landscaping tools (shovels, rakes, etc.), $30.00; 10-speed bicycle, $90.00.

Assets at end of year:
Cash on hand, $40.00; cash in checking account, $95.00; cash in savings account, $180.00; life insurance (cash value), $55.00; landscaping tools (shovels, rakes, wheelbarrows, etc.), $50.00; 10-speed bicycle, $80.00.

Liabilities at beginning of year:
Linda owes her parents $50.00 for a bicycle.

Liabilities at end of year:
Linda owes her parents $25.00 for a bicycle and $10.00 for landscaping tools she purchased.

PROBLEM 2: Don raises vegetables for his S.O.E.P. The following is a list of his beginning and ending assets and liabilities. Determine his beginning and ending net worth and his change in net worth.

Assets at beginning of year:
Cash on hand, $10.00; cash in checking account, $30.00; cash in savings account, $210.00; life insurance (cash value), $75.00; 10-speed bicycle, $50.00.

Assets at end of year:
Cash on hand, $20.00; cash in checking account, $60.00; cash in savings account, $340.00; life insurance (cash value), $80.00; garden tiller, $200.00; 10-speed bicycle, $40.00.

Liabilities at beginning of year:
None

Liabilities at end of year:
Don owes his parents $175.00 for the garden tiller he purchased.

PROBLEM 3: Determine your own net worth and your change in net worth. Use the answers to Problems 1 and 2 as a reference.

STUDENT WORKSHEET 2

COMPLETING THE FRUIT OR VEGETABLE PRODUCTION RECORD BOOK

Using the information given in this worksheet, you will be able to complete your S.O.E. Program Record Book. The accuracy and appearance of your record book is extremely important. It is suggested that all entries be made in pencil, so that erasures can be made. Remember, your record book will be judged for FFA Foundation awards, so be careful when completing it!

PART I: Which pages of the Fruit or Vegetable Production Record Book should be completed?

STEP 1 - The record book pages listed below should have been completed when planning your S.O.E. program. Check each of these pages to be sure they are complete.

Pages: 1,2,3,4,5 and 9

STEP 2 - The record book pages listed below should have been completed during your S.O.E. program. Check each of these pages to be sure they are complete.

Pages: 6,7,8,9,10,11 (show record and showing expenses), 13 and 14

STEP 3 - The pages listed below need to be completed to close out the record book.

Pages: 11 (summary), 12 and 15

Refer to Part II for instructions on how to complete these pages.

PART II: The following instructions provide a brief explanation of how to complete Pages 11, 12, and 15 in your Fruit or Vegetable Production Record Book. Completed sample record books have been provided to help you. In addition, you may ask questions of the members of your group.

STEP 1 - Completing the Summary on Page 11.

SUMMARY - FRUIT OR VEGETABLE ENTERPRISE

Name Sarah Brown

Date Jan. 10, 1984

A.	Home use and sale of products (page 10)	$ 110.40
B.	Seed and plant expenses (page 7)	$ 25.35
C.	Returns to garden (A minus B)	$ 85.05
	Machinery-tillage & misc.	$ 16.00
	Chemicals-fertilizer	$ 4.70
D.	Total Expenses	$ 20.70
E.	Labor and management earnings (C minus D)	$ 64.35
F.	Labor 25 hours at $2.00 per hour	$ 50.00
G.	Net income from showing garden	$ 4.00

A. Home use and sale of products--The dollar figure inserted here is taken from page 10 of your record book. It is the total dollar value of all the products listed on page 10. If you added all the amounts listed in the total value column on page 10 and got an amount of $110.40, then $110.40 would be the number you put by letter A on page 11.

B. Seed and plant expenses--The dollar figure inserted here is taken from page 7 of your record book. Add up all the entries listed under the plants, seed column. If the total amount you added equals $25.35, then enter $25.35 by letter B on page 11.

C. 1. Returns to garden--Subtract the amount shown in letter B from the amount shown in letter A. Enter this number by letter C on page 11. Example: A minus B = C

Home Use and Sale of Products MINUS Seed and Plant Expenses = Returns to Garden

$110.40
- 25.35
$ 85.05

2. Machinery--tillage and miscellaneous--The dollar figure inserted here is taken from page 7 of your record book. Add up all the entries listed under the machinery, tillage column. If the total amount you added equals $16.00, then $16.00 would be the number you put by machinery-tillage and miscellaneous on page 11.

3. Chemicals--fertilizer--The dollar figure inserted here is taken from page 7 of your record book. Add up all the entries listed under the chemicals, fertilizer column. If the total amount you added equals \$4.70, then \$4.70 would be the number you put by Chemicals-fertilizer on page 11.

D. Total Expenses--Add the number entered by Machinery-tillage and miscellaneous, and Chemicals-fertilizer together to determine your total expenses. Enter this number by letter D on page 11.

Example: Machinery, tillage & miscellaneous + Chemicals-fertilizer = Total Expenses

$$\begin{array}{r} \$16.00 \\ +\ 4.70 \\ \hline \$20.70 \end{array}$$

E. Labor and management earnings--Subtract the amount shown in letter D from the amount shown in letter C. Enter this number by letter E on page 11.

Example: C minus D = E

Returns to garden MINUS Total expenses (taken from Line d) = Labor and management earnings

$$\begin{array}{r} \$85.05 \\ -\ 20.70 \\ \hline \$64.35 \end{array}$$

F. Labor--The number of hours of labor is taken from totaling the self hours column on page 8 of your record book. If you had 25 hours of self labor, enter 25 in the hours blank by letter F. The cost per hour can be either minimum wage or a standard rate set by your vo-ag teacher. For this example \$2.00 will be entered as the per hour rate.

To determine what dollar figure should be entered by letter F, multiply the number of hours labor times the dollar rate per hour. Enter this amount on line F.

Example: Labor hours x rate per hour = Total labor cost

$$\begin{array}{r} \$25.00 \\ \times\ 2.00 \\ \hline \$50.00 \end{array}$$

NOTE: If you had any hired labor, you must add the total cost of your hired labor (taken from page 8) to the total cost of your own labor. For example, if you paid someone \$5.00 to apply fertilizer, you would have to add \$5.00 to your own self-labor cost. Enter this number by letter F.

Example: Self labor cost + Hired labor cost = Total labor cost

$50.00 ($25 x 2)
+ 5.00 (from page 8)
$55.00 Total labor costs

In most cases, the work is done yourself. Therefore, the self labor cost is usually the same as total labor cost.

G. Net income from showing garden--The dollar figure inserted here is taken from the Showing Record Summary--Net Income on page 11. If you earned $4.00 showing your fruits and/or vegetables, then enter $4.00 by letter G on page 11.

STEP 2 - Completing the Financial Statement on Page 12

A. Refer to the Student Worksheet--My Financial Statement, Problems 1 and 2 to help you determine your net worth.

STEP 3 - Completing the Narration on page 15

Refer to the Information Sheet--Guidelines for Completing the Record Book Narration handed out and discussed in class.

STUDENT WORKSHEET 3

COMPLETING THE FLORICULTURE RECORD BOOK

Using the information given in this worksheet, you will be able to complete your S.O.E. Program Record Book. The accuracy and appearance of your record book is extremely important. It is suggested that all entries be made in pencil, so that erasures can be made. Remember, your record book will be judged for FFA Foundation awards, so be careful when completing it!

PART I:

STEP 1 - The record book pages listed below should have been completed when planning your S.O.E. program. Check each of these pages to be sure they are complete.

Pages: 1, 2 and 13 (initial inventory)

STEP 2 - The record book pages listed below should have been completed during your S.O.E. program. Check each of these pages to be sure they are complete.

Pages: 2,3,4,5,6,7,8,10,11,12,15,16,17 and 18

STEP 3 - The pages listed below need to be completed to close out the record book.

Pages: 9, 13 (ending inventory), 14 and 19

Refer to Part II for instructions on how to complete these pages.

PART II: The following instructions provide a brief explanation of how to complete pages 9, 13, 14, and 19 in your Floriculture Record Book. Completed sample record books have been provided to help you. In addition, you may ask questions of the members of your group.

STEP 1 - Completing the Financial Summary on Page 9

FINANCIAL SUMMARY

Month	Employer(s)	Total Hours	Gross Pay	Soc. Sec. Tax	Income Tax Fed.	Income Tax State	Other	Take Home Pay
JAN.	FLORAL DESIGN	10	20.00	.15	.70	.40	–	18.75
FEB.	FLORAL DESIGN	20	40.00	.30	1.40	.80	–	37.50
MARCH	FLORAL DESIGN	10	20.00	.15	.70	.40	–	18.75
							–	
TOTALS	XXXX	40	80.00	.60	2.80	1.60	–	75.00

A. Transfer the information you recorded on pages 3 through 8 (Total for month) to the Financial Summary on page 9.

B. Information such as social security tax, income tax, et cetera, can be taken from the wage statement which normally accompanies your pay check.

C. Total the figures listed under each column.

STEP 2 - Completing the Ending Inventory on Page 13

ENDING INVENTORY

Year Purchased	Description of Inventory Item	Source or Origin of Inventory Item	Quantity	Percent Owned by Applicant	Value of Applicant's Share
1984	Bowls, oasis	Bud's Floral Supply	1 box	100	21.50
1984	Floral Vases	Bud's Floral Supply	2	100	17.00
TOTAL	XXXXXXX	XXXXXX	XXX	XXXX	$ 38.50

A. List only those items concerned with Floriculture, owned or owned in partnership as of December 31 that were of value in carrying out your program.

B. The ending inventory is similar to the initial inventory with one exception. In the ending inventory, you list the remaining value of each item owned at the end of the year. In the initial inventory you listed the acquisition cost of those items owned at the beginning of the year.

STEP 3 - Completing the Financial Statement on Page 14

A. Refer to the Student Worksheet--My Financial Statement, Problems 1 and 2 to help you determine your net worth.

STEP 4 - Completing the Narration on Page 19

A. Refer to the Information Sheet--Guidelines for Completing the Record Book Narration handed out and discussed in class.

STUDENT WORKSHEET 4

COMPLETING THE NURSERY OPERATIONS RECORD BOOK

Using the information given in this worksheet, you will be able to complete your S.O.E. Program Record Book. The accuracy and appearance of your record book is extremely important. It is suggested that all entries be made in pencil, so that erasures can be made. Remember, your record book will be judged for FFA Foundation awards, so be careful when completing it!

PART I:

STEP 1 - The record book pages listed below should have been completed when planning your S.O.E. program. Check each of these pages to be sure they are complete.

Pages: 1, 2, 13 (initial inventory)

STEP 2 - The record book pages listed below should have been completed during your S.O.E. program. Check each of these pages to be sure they are complete.

Pages: 2,3,4,5,6,7,8,10,11,12,15,16,17 and 18

STEP 3 - The pages listed below need to be completed to close out the record book.

Pages: 9, 13 (ending inventory), 14 and 19

Refer to Part II for instructions on how to complete these pages.

PART II: The following instructions provide a brief explanation of how to complete pages 9, 13, 14, and 19 in your Nursery Operations Record Book. Completed sample record books have been provided to help you. In addition, you may ask questions of the members of your group.

STEP 1 - Completing the Financial Summary on Page 9

FINANCIAL SUMMARY

Month	Employer(s)	Total Hours	Gross Pay	Soc. Sec. Tax	Income Tax		Other	Take Home Pay
					Fed.	State		
FEB.	NORTH NURSERY	10	20.00	.15	.70	.40	—	18.75
MARCH	NORTH NURSERY	20	40.00	.30	1.40	.80	—	37.50
APRIL	NORTH NURSERY	10	20.00	.15	.70	.40	–	18.50
TOTALS	XXXX	40	80.00	.60	2.80	1.60	–	75.00

A. Transfer the information you recorded on pages 3 through 8 (Total for month) to the Financial Summary on page 9.

B. Information such as social security tax, income tax, et cetera, can be taken from the wage statement which normally accompanies your pay check.

C. Total the figures listed under each column.

STEP 2 - Completing the Ending Inventory on Page 13

ENDING INVENTORY

Year Purchased	Description of Inventory Item	Source or Origin of Inventory Item	Quantity	Percent Owned by Applicant	Value of Applicant's Share
1984	Wheelbarrow	Town Hardware	1	50	30.00
1984	Hedge Shears	Parents	1	100	10.00
TOTAL	XXXXXXX	XXXXXX	XXX	XXXX	$ 40.00

A. List only those items concerned with Nursery Operations owned or owned in partnership as of December 31 that were of value in carrying out your program.

B. The ending inventory is similar to the initial inventory with one exception. In the ending inventory, you list the remaining value of each item owned at the end of the year. In the initial inventory you listed the acquisition cost of those items owned at the beginning of the year.

STEP 3 - Completing the Financial Statement on Page 14

A. Refer to the Student Worksheet--My Financial Statement, Problems 1 and 2 to help you determine your net worth.

STEP 4 - Completing the Narration on Page 19

A. Refer to the Information Sheet--Guidelines for Completing the Record Book Narration handed out and discussed in class.

STUDENT WORKSHEET 5

COMPLETING THE TURF AND LANDSCAPE MANAGEMENT RECORD BOOK

Using the information given in this worksheet, you will be able to complete your S.O.E. Program Record Book. The accuracy and appearance of your record book is extremely important. It is suggested that all entries be made in pencil, so that erasures can be made. Remember, your record book will be judged for FFA Foundation awards, so be careful when completing it!

PART I:

STEP 1 - The record book pages listed below should have been completed when planning your S.O.E. program. Check each of these pages to be sure they are complete.

Pages: 1, 2 and 13 (initial inventory)

STEP 2 - The record book pages listed below should have been completed during your S.O.E. program. Check each of these pages to be sure they are complete.

Pages: 2,3,4,5,6,7,8,10,11,12,15,16,17 and 18

STEP 3 - The pages listed below need to be completed to close out the record book.

Pages: 9, 13 (ending inventory), 14 and 19

Refer to Part II for instructions on how to complete these pages.

PART II: The following instructions provide a brief explanation of how to complete pages 9, 13, 14, and 19 in your Turf and Landscape Management Record Book. Completed sample record books have been provided to help you. In addition, you may ask questions of the members of your group.

STEP 1 - Completing the Financial Summary on Page 9

FINANCIAL SUMMARY

Month	Employer(s)	Total Hours	Gross Pay	Soc. Sec. Tax	Income Tax		Other	Take Home Pay
					Fed.	State		
MARCH	T.J. Loggers	10	20.00	.15	.70	.40	—	18.75
APRIL	T.J. Loggers	20	40.00	.30	1.40	.80	—	37.50
MAY	T.J. Loggers	10	20.00	.15	.70	.40	—	18.50
TOTALS	XXXX	40	80.00	.60	2.80	1.60	—	75.00

A. Transfer the information you recorded on pages 3 through 8 (Total for month) to the Financial Summary on page 9.

B. Information such as social security tax, income tax, et cetera, can be taken from the wage statement which normally accompanies your pay check.

C. Total the figures listed under each column.

STEP 2 - Completing the Ending Inventory on Page 13

ENDING INVENTORY

Year Purchased	Description of Inventory Item	Source or Origin of Inventory Item	Quantity	Percent Owned by Applicant	Value of Applicant's Share
1984	Leaf Rake	FRED'S HARDWARE	2	100	5.00
1984	Garden hoe	FRED'S HARDWARE	1	100	4.00
1984	Pruning shears	FRED'S HARDWARE	1	100	8.00
TOTAL	XXXXXXX	XXXXXX	XXX	XXXX	$17.00

A. List only those items concerned with Turf and Landscape Management owned or owned in partnership as of December 31 that were of value in carrying out your program.

B. The ending inventory is similar to the initial inventory with one exception. In the ending inventory, you list the remaining value of each item owned at the end of the year. In the initial inventory you listed the acquisition cost of those items owned at the beginning of the year.

STEP 3 - Completing the Financial Statement on Page 14

A. Refer to the Student Worksheet--My Financial Statement, Problems 1 and 2 to help you determine your net worth.

STEP 4 - Completing the Narration on Page 19

A. Refer to the Information Sheet--Guidelines for Completing the Record Book Narration handed out and discussed in class.

STUDENT WORKSHEET 6

EVALUATING THE SUPERVISED OCCUPATIONAL EXPERIENCE PROGRAM

Directions: Circle the number which indicates whether you strongly disagree (SD), disagree (D), agree (A), or strongly agree (SA) with each of the following statements.

CONDUCTING AN S.O.E.P. HELPED ME LEARN

1.	How to prepare a budget	SD	D	A	SA
2.	How to set and reach goals	SD	D	A	SA
3.	How to establish priorities	SD	D	A	SA
4.	How to explore career choices	SD	D	A	SA
5.	How to be organized	SD	D	A	SA
6.	How to manage time	SD	D	A	SA
7.	How to make decisions	SD	D	A	SA
8.	Responsibility	SD	D	A	SA
9.	How to manage (earn & invest) money	SD	D	A	SA
10.	How to become economically independent	SD	D	A	SA
11.	Management skills	SD	D	A	SA
12.	How to keep neat, accurate records	SD	D	A	SA
13.	New job skills	SD	D	A	SA
14.	How to apply knowledge gained in horticulture class and lab	SD	D	A	SA
15.	How to develop my horticulture skills (occupational competencies)	SD	D	A	SA
16.	How to work with other people	SD	D	A	SA
17.	How to communicate with other people	SD	D	A	SA
18.	How to write better	SD	D	A	SA
19.	How to take charge and be a leader	SD	D	A	SA
20.	How to use records to improve and expand my S.O.E.P.	SD	D	A	SA

CONDUCTING AN S.O.E.P. HELPED ME LEARN

21.	The value of work	SD	D	A	SA
22.	Proper work habits and attitudes	SD	D	A	SA
23.	How to analyze the strengths and weaknesses of my S.O.E.P.	SD	D	A	SA
24.	What type of occupation I am interested in pursuing	SD	D	A	SA
25.	How to evaluate my own values, abilities and interests	SD	D	A	SA

TEACHER'S KEY

STUDENT WORKSHEET 1 - PROBLEM 1

MY FINANCIAL STATEMENT

YEAR: BEGINNING Jan. 1, 1984 ENDING Dec. 31, 1984

	Beginning of year	End of year
ASSETS:		
Cash on hand	25.00	40.00
Cash in checking account	50.00	95.00
Cash in savings account	125.00	180.00
Market value of stocks or bonds		
Life insurance (cash value)	50.00	55.00
Accounts receivable		
Value of Land, Buildings, & Equipment		
Landscaping tools	30.00	50.00
Value of Livestock, Crops, & Feed		
Other Assets (List)		
10 speed bicycle	90.00	80.00
TOTAL ASSETS----	370.00	500.00
LIABILITIES:		
Unpaid bills		
Accounts payable		
Notes (to be paid)		
Other liabilities (List)		
10 speed bicycle	50.00	25.00
Landscaping tools - owes parents		10.00
TOTAL LIABILITIES----	50.00	35.00
STUDENT'S NET WORTH----	320.00	465.00
STUDENT'S CHANGE IN NET WORTH----		145.00

TEACHER'S KEY

STUDENT WORKSHEET 1 - PROBLEM 2

MY FINANCIAL STATEMENT

YEAR: BEGINNING Jan. 1, 1984 ENDING Dec. 31, 1984

	Beginning of year	End of year
ASSETS:		
Cash on hand	10.00	20.00
Cash in checking account	30.00	60.00
Cash in savings account	210.00	340.00
Market value of stocks or bonds		
Life insurance (cash value)	75.00	80.00
Accounts receivable		
Value of Land, Buildings, & Equipment		
Garden tiller		200.00
Value of Livestock, Crops, & Feed		
Other Assets (List)		
10 speed bicycle	50.00	40.00
TOTAL ASSETS----	375.00	740.00
LIABILITIES:		
Unpaid bills		
Accounts payable		
Notes (to be paid)		
Other liabilities (List)		
Garden tiller - owes parents		175.00
TOTAL LIABILITIES----	0.00	175.00
STUDENT'S NET WORTH----	375.00	565.00
STUDENT'S CHANGE IN NET WORTH----		190.00

REASONS FOR SUMMARIZING AND ANALYZING AGRICULTURAL BUSINESS RECORDS

1. To determine profit or loss.
2. To observe financial progress over a period of years.
3. To determine which enterprises are profitable.
4. To provide a basis for sound management decisions.
5. To furnish information for income tax returns.
6. To provide information for FFA degree advancement and FFA award programs.

MY FINANCIAL STATEMENT

YEAR: BEGINNING __________, 19__ ENDING __________, 19__

	Beginning of year	End of year
ASSETS:		
Cash on hand		
Cash in checking account		
Cash in savings account		
Market value of stocks or bonds		
Life insurance (cash value)		
Accounts receivable		
Value of Land, Buildings, & Equipment		
Value of Livestock, Crops, & Feed		
Other Assets (List)		
TOTAL ASSETS----		
LIABILITIES:		
Unpaid bills		
Accounts payable		
Notes (to be paid)		
Other liabilities (List)		
TOTAL LIABILITIES----		
STUDENT'S NET WORTH----		
STUDENT'S CHANGE IN NET WORTH----		

UNIT C: LEADERSHIP IN HORTICULTURE/AGRICULTURE

PROBLEM AREA: UTILIZING HORTICULTURAL ORGANIZATIONS & RESOURCES

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with eleventh grade or advanced students in a horticultural occupations program. The recommended time for teaching this problem area is during the winter months, when outdoor activities cannot be conducted.

The estimated instructional time for this problem area is 2 to 3 days depending on how much time the teacher wishes to spend on conducting the suggested exercises.

Horticultural organizations can provide valuable resources for the classroom, including guest speakers, field trip locations, visual aids and instructional materials. In addition, resource persons can assist instructors with limited knowledge in a particular area of horticulture, by providing information for the preparation of lesson plans. This problem area is intended to provide instructors with a reference to many horticultural organizations and resources. It is not intended to be an inclusive list of all organizations and resources.

Information Sheets 1 through 3 were utilized to survey the organizations and resources included in this problem area. Instructors are encouraged to use these forms to add additional local resources to meet the needs of individual programs. Utilizing resources within the community will enhance the quality of education for future horticulturists by keeping information relevant and up-to-date. It can promote integration between the school and community and provide valuable information that "isn't found in the books".

CREDIT SOURCES:

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TEACHER'S GUIDE

I. Unit: Leadership in horticulture/agriculture

II. Problem area: Utilizing horticultural organizations and resources

III. Objectives: At the end of this problem area the students will be able to:

1. Identify major horticultural organizations and resources and their purposes.
2. Locate horticultural organizations and resources.
3. Recognize the benefits of belonging to horticultural organizations.
4. Utilize the services provided by horticultural organizations.

IV. Suggested interest approaches:

1. Lead a discussion with the students concerning the various organizations that they belong to at school. Ask one or more of the following lead questions:
    - A. Why did you join this organization?
    - B. How did you hear about it?
    - C. What benefits have you gained as a member?
    - D. Have you ever been an officer?
2. Ask the students if they can name any professional horticultural organizations that their parents or employers belong to.
3. Invite members of the community that belong to horticultural organizations to speak to the class.
4. Ask the students whom they would consult, if confronted with a special problem, or needed a new source of supplies.
5. Contact organizations that provide slides or films describing their activities.
6. Have students compile a list of horticultural resources common to their area.

V. Anticipated problems and concerns:

1. What are the various types of horticultural organizations and what purpose do they serve?
2. How can I benefit by belonging to an organization?

3. How do I become a member of these organizations?

4. Do some organizations have memberships especially for students?

5. What other resources can I utilize besides professional organizations?

6. How do I locate local information about horticultural organizations?

7. What is a trade journal?

VI. Suggested learning activities:

1. Utilize Information Sheets 1 through 3 to add additional local resources, such as retail businesses, to this problem area. Instructors may also wish to include a section on the forms to locate those members of the community that would like to sponsor a supervised occupational experience program, potential advisory committee members, and assistants for the local FFA chapter.

2. Distribute Information Sheets 4 through 6 and discuss the various horticultural organizations and resources.

3. Have each student select a horticultural organization or resource. Have them write to the organization and gather information for a class presentation.

4. Using Student Worksheet 1 - Horticultural/Agricultural Organization Facts, have students fill out information including membership requirements and publications pertaining to student organizations, FFA, or 4-H.

5. Have students use Student Worksheet 1 to assist them in gathering information on organizations for class presentations.

6. Have the student interview owners of local florists, garden centers, nurseries and other horticultural related businesses to determine what organizations they belong to and how they benefit from them. Use Student Worksheet 2 - Interviewing a Local Agribusiness Person.

7. Visit a local organization during a business meeting. Have each student write a summary of the meeting as if they were a reporter from the local newspaper.

8. Evaluate organizations students are currently members of by listing qualities found in the "good" organizations that are missing from the less effective ones.

9. Request donations of old trade papers and magazines from local business people. Have the students prepare a file on various topics including: meetings, government regulations, new products, supplies, holiday products and customer relations.

10. Invite several resource persons from horticultural professions to speak to students about the purposes of professional organizations and the commitment they must give as a member. Also have them discuss what the organization has to offer a high school student.

11. Provide students educational information about several professional organizations. Have students provide a written and/or oral report as to the goals, functions, and activities of a professional organization of their choice.

12. Subscribe to publications listed in Information Sheet 6. Have students locate other horticultural references in the school and/or local libraries.

13. Assign each student a simulated horticultural problem. Have them solve the problem by locating a variety of resources such as books, magazines, horticultural organizations and resource persons.

VII. Application procedures:

1. The students may join and participate in horticultural organizations and activities.
2. The students may subscribe to and utilize industry publications and trade magazines.
3. The students may use the organizational information they have gathered and apply it to school organizations such as FFA, 4-H, and horticultural clubs.
4. Students may utilize organizations as resources, when confronted with questions on the job.

VIII. Evaluation:

1. Grade student presentations on information gathered from one organization.
2. Grade student presentations of personal interview with a member of an organization.
3. Administer a pencil and paper exam covering in-class discussion of various organizations, guest speakers and field trips.

IX. References and aids:

1. Selected information sheets
2. Selected student worksheets

INFORMATION SHEET 1

RESOURCE INFORMATION FORM FOR ARBORETUMS, BOTANICAL GARDENS, AND PARKS

Name of park/garden ______________________________

Address ______________________________

Contact person ____________________ (Name and Position) Phone __________

Available for: field trip ________ speaker ________ other ________

Does your organization provide any information sheets or publications? ______

Is a fee required? ____________________

If your park is available for a field trip, what are your points of interest?

Amount of notice needed. ____________________

Limit to number of participants? No ______ Yes ______ Number ______

Are speakers available, and if so, what topics are discussed?

Please provide any additional information. ____________________

INFORMATION SHEET 2

RESOURCE INFORMATION FORM FOR GROWERS, WHOLESALERS AND RETAIL BUSINESSES

Name of business ______________________________

Address ______________________ County ____________

Contact person ______________________ Phone ____________
(Name and Position)

Available for: speaker ________ field trip ________ other ________

If your business is available for a field trip, what are your points of interest?

____

____

____

____

____

Amount of notice needed. ______________________________

Limit to the number of participants? No ____ Yes ____ Number ________

If you are available as a speaker, what topic(s) would you like to talk about?

____

____

____

____

____

Will you be doing a demonstration? If so what kind? ____________

____

____

Please provide any additional information. ____________

____

____

INFORMATION SHEET 3

RESOURCE INFORMATION FORM FOR TRADE ORGANIZATIONS & PUBLICATIONS

Name of organization/publication______________________________

Address____

Contact person__________________________ Phone__________

Available for: speaker________ informative publications________

other__________

If your representative is available as a speaker, what topic(s) would he/she wish to discuss?

____

____

____

____

____

If your organization provides printed materials, what subjects do they cover?

____

____

____

Does your organization have student memberships?

No______ Yes______ Cost________

Cost to the teacher/school for publications and or membership.________

____

Please provide any additional information.____________________

____

____

INFORMATION SHEET 4

ARBORETUMS, BOTANICAL GARDENS, PARKS

1. Boerner Botanical Gardens
5879 S. 92nd Street
Hales Corners, Wisconsin 53130

Contact:
William J. Radler, Director
(414) 425-1132

The Boerner Botanical Gardens is available for field trips accomodating up to 20 participants. Two weeks advanced notice is needed in writing and a one dollar fee is charged per person. In addition, a listing of over 175 horticultural publications can be obtained by writing the above address.

2. Chicago Botanical Gardens
P.O. Box 400
Glencoe, Illinois 60022

Contact:
Linda Lutz, Education Coordinator
(312) 835-5440

The Chicago Botanical Gardens is available for field trips accomodating up to 60 students when advanced notice is given. Areas of interest include educational greenhouses, prairie restoration, nature trail, and the plant evaluation, aquatic bulb, Japanese island, annual trial, and home landscape demonstration gardens. Speaking requests are filled by a volunteer speakers bureau. Most topics center on gardening practices, floral material, landscape design and educational opportunities at the Chicago Botanical Garden. Ten assorted fact sheets dealing with topics such as house plants, plants for the Chicago area, vegetative and prairie vegetation, forcing bulbs and holiday gift plants are available at a cost of twenty-five cents per sheet.

3. Lake of the Woods Botanical Gardens
P.O. Box 336
Mahomet, Illinois 61853

Contact:
Roger Kirkwood, Superintendent
(217) 586-2612

Lake of the Woods Botanical Gardens is available for field trips at a cost of seventy-five cents per student for non-Champaign County groups (Champaign county groups are free). A minimum of seven days advanced notice is preferred. The number of participants allowed depends upon prior reservations and the nature of the program desired. Points of interest include the herb, dye-plant, antique rose, perennial, and all-America selections display gardens, native prairie grasses and a 90' x 35' glass conservatory. In addition to group field trips, students (on a case by case basis) may be allowed to work on independent study projects.

4. Lincoln Park Conservatory
2400 N. Stockton Drive
Chicago, Illinois 60614

Contact:
Walter Edens or Leonard Gayten
(312) 294-4771

The Lincoln Park Conservatory is available for field trips if two weeks advanced notice is given. There is no admission charge and no limit on the number of participants. Permanent plantings in the palm, fern and warm houses as well as seasonal shows are the major attractions.

Lectures are provided for interested groups within the boundaries of Chicago. Topics include annual flower shows, forcing major greenhouse crops, and flower gardens. There is no charge for lectures given during regular working hours. The conservatory also publishes brochures describing its history, annual shows, and adjacent gardens and grounds.

5.	Missouri Botanical Gardens P.O. Box 299 St. Louis, Missouri 63166	Contact: Educational Department (314)577-5140

The Missouri Botanical Gardens is available for field trips if given 2 to 4 weeks advanced notice. The number of participants is limited according to the amount of time the group wishes to spend and whether a guided or self-guided tour is taken. Points of interest include a 14-acre Japanese garden, the herb, English woodland, scented, perennial, hosta, rose and vegetable gardens, and four conservatories featuring tropical, desert, and Mediterranean plant collections. Throughout the year various exhibits and educational programs and classes are available. A group fee is required. A speakers bureau provides lectures on a number of scientific and horticultural topics; however, this is only available on a local basis. Scientific and informational materials can be obtained at the Education Department Resource Center. There is no cost for these materials unless they are shipped.

6.	The Morton Arboretum Route 53 Lisle, Illinois 60532	Contact: Joanne Drake, Registrar (312) 969-5682

Guided tours of the Morton Arboretum are available if 2 weeks advance notice is given. The botanical collections, native woodlands and display gardens are major points of interest. Speakers are available on a variety of topics (contact Joe Larkin, Public Relations Coordinator). The Morton Aboretum Quarterly is published at a cost of $1.50 each.

7.	Museum Cantigny 1 S 151 Winfield Road Wheaton, Illinois 60187	Contact: Arthur Veysey, General Manager (312)668-5161

One of the few formal gardens in Illinois is located at the Museum Cantigny in addition to a greenhouse for growing 90,000 annuals, a model of an experimental sun house and the first division war museum. All are available for a field trip with no limit on the number of participants. Speakers can be provided on the history of Cantigny, the life of Col. Robert McCormick and how a public park is operated. A self-guided tour, map of the grounds, directions to reach the garden and a photo phamphlet of the garden highlights are published by the museum.

INFORMATION SHEET 5

GROWERS AND WHOLESALERS

1. Elmhurst Flower Growers, Inc.
2 N. 134 Addison Road
P.O. Box 246
Addison, Illinois 60101

Contact:
Ron Hausermann
Sales Manager/Owner
(312) 543-5600

A tour of these facilities is available for up to 40 students. Two weeks advanced notice is necessary. Points of interest include a 120,000 square foot greenhouse, methods of growing orchids and processing and shipping cut orchid flowers to the wholesale market.

2. Geneva Flower Farm
37 W. 563 Kaneville Road
Geneva, Illinois 60134

Contact:
Donn Dolby
(312) 232-8066

One month advanced notice is needed to tour this small potted plant operation. All work including delivery, sales, bookkeeping and disbudding is done by only three individuals. Crops grown include year-round pot mums, lilies, poinsettias with many exhibition sizes, and fast crop geraniums. There is no limit on the number of participants. A speaker can also be provided to discuss opportunities for horticultural graduates, preparing for your first job, and the value of college horticultural training.

3. Illinois Roses Ltd.
P.O. Box 428
Pana, Illinois 62557

Contact:
Gene Schmitz
(217) 562-3964

Over 330,000 rose plants are grown in the greenhouse for cut flowers. One week advanced notice is needed to tour the facility.

4. Floral Life Inc.
7 Salt Creek Lane
Hinsdale, Illinois 60521

Contact:
Dean Rule
(800) 323-3689

Floral Life Inc. can provide a speaker to discuss the care and handling of floral products and the use of floral sprays (film available). A demonstration using fresh products, preservatives and other techniques can be arranged.

5. Kennicott Brothers Wholesale Florists Co.
1317 W. Randolph Street
Chicago, Illinois 60607

Contact:
Harrison Kennicott
(312) 421-0465

Major points of interest include cut flowers, greens, bouquets, designs, dry flowers and hard goods. There is no limit on the number of participants in a field trip to this facility.

6. Roy Houff Co.
240 Shore Drive
Burr Ridge, Illinois 60521

Contact:
Roy Houff
(312) 986-9030

This wholesale florist company is available for a field trip with an unlimited number of participants.

7. Tropical Plant Rentals Inc.
P.O. Box 146
Prairie View, Illinois 60069

Contact:
Ken Brewer, Operations Manager
(312) 634-4100

A minimum of two weeks advanced notice is needed to tour ten acres of foliage and flowering plants. A maximum of 50 participants is usually allowed. Presentations can be made on plant rentals and related topics.

No general tours will be provided. Only groups having specific educational purposes and objectives will be allowed to visit the business.

ADDITIONAL WHOLESALERS:

1. Chicago Florist Supply
1340 West Lake Street
Chicago, Illinois 60607

2. Bill Doran Co.
619 W. Jefferson
Rockford, Illinois 61103

3. Platz Flower and Supply
8501 Frontage Rd.
Morton Grove, Illinois 60053

4. Vans Inc.
3730 W. 131st Street
Alsip, Illinois 60658

5. S & S Wholesale Florist
64 E. 14th Street
Chicago, Illinois 60605

ADDITIONAL GROWERS:

1. Frank Cleasen and Son
316 Florence Ave.
Evanston, Illinois 60202

2. Four Seasons Roses
East Union Avenue
Litchfield, Illinois 62056

3. G & E Greenhouses
531 S. Harrison
Batavia, Illinois 60510

4. Lieder & Sons
P.O. Box 147 Aptakisic Rd.
Prairie View, Illinois 60069

5. Nelson & Homberg
3521 S. Highland Ave.
Berwyn, Illinois 60402

INFORMATION SHEET 6

TRADE ORGANIZATIONS AND PUBLICATIONS

1. Society of American Florists
901 N. Washington St.
Alexandria, VA 22314

Contact:
James E. Wanko
Exec. Vice President
(703)836-8700

The publication "Careers in Floriculture" provides a listing of all state universities offering a degree in horticulture. Multiple copies are provided at a cost of 50¢ each, but single copies are free.

2. Flower Council of Holland
250 West 57th Street
New York City, New York 10019

Contact:
Lilli Ann Bresnahan, Director, Public Relations
(212)307-1818

Printed materials covering the care and handling of Holland fresh cut flowers are available. A fee is charged if required in quantities.

3. Teleflora, Inc.
2400 Compton Blvd.
Redondo Beach, California 90278

Contact:
Kathy Sellree, Public Relations
(213)973-2501

Teleflora provides free printed materials pertaining to retail florist shop owners upon written request. Area representatives are also available to discuss floral products and services, and utilizing flower wiring services.

4. American Floral Services, Inc.
3737 N.W. 34th
P.O. Box 12309
Oklahoma City, Oklahoma 73157

Contact:
Eulalah Overmeyer, V.P. Ind. Relations
(800)654-6707

American Floral Services, Inc. publishes Floriculture Directions, a monthly bulletin (sent free of charge to instructors upon receipt of the floral curriculum), and The Professional Floral Designer, a bi-monthly magazine (available at a student rate of $25.00 per year). Audio-visual programs can also be made available.

5. Illinois State Florist Association
505 S. 23rd Street
Mattoon, Illinois 61938

Contact:
Dan Irons, Executive Director
(217)258-8969

The purpose of the Illinois State Florists' Association is to advance the interests and welfare of the florist industry at all levels. It is affiliated with the Society of American Florists.

The ISFA publishes a 28 to 36 page bi-monthly bulletin for its members which includes articles and features of interest to all phases of the floriculture industry. The publication can be made available to teachers at a reduced cost by contacting the editor (G.M. Fosler, 1011 W. Healey Street, Champaign, Illinois 61821).

Other activities of the ISFA which can benefit teachers and students are listed below:

1. ISFA sponsors an annual conference and trade show in early March.

2. ISFA has a scholarship program which includes:

   A. One Jonathan Baldwin Turner Scholarship in Floriculture for entering freshman in the University of Illinois College of Agriculture.

   B. Six $500.00 scholarships yearly to floriculture students in 2 and 4 year Illinois college or university floriculture programs.

3. Cooperation with schools in the selection of florists for speaking engagements, demonstrations or tours, and for assistance in regard to their horticultural programs.

6. Illinois State Nurserymen's Association
Suite 1702
Springfield Hilton
Springfield, Illinois 62701

Contact:
James Hayward
(217) 525-6222

The Illinois State Nurserymen's Association has been active for the past 56 years. The membership includes most of the leading and progressive nurseries in the state, as well as growers, garden centers, and industry suppliers throughout the country.

The main objective of the ISNA is to promote horticulture in a broad sense, i.e., by promoting increased knowledge and use of nursery products by the public, and by providing safeguards to the planting public.

The Association maintains close liaison with state governmental agencies and institutions of learning. It sponsors trade shows, provides educational services for its members, supports research and issues scholarships.

The activities of the Illinois State Nurserymen's Association listed below can benefit both high school teachers and students.

1. Offers educational meetings that the trade and teachers can attend.

2. ISNA co-sponsor's the Mid-American Horticultural Trade Show.

3. ISNA prints a membership directory with a wealth of reference materials related to plants, sprays, measurements and resource persons.

4. ISNA publishes a newsletter which contains educational material.

5. ISNA has a slide set and picture set entitled Diagnosing Plant Problems which can be made available to schools.

7. Illinois State Horticultural Society
Carlinville, Illinois 62626
Contact:
Mr. William Broom

The Illinois State Horticultural Society was organized in 1957. In January, it held its 125th annual meeting. The society's objective is the advancement of the science of pomology and the arts of horticulture. It is a non-profit organization comprised of fruit producers and other interested individuals.

8. Illinois State Vegetable Growers Association
17510 Carder Valley Road
Woodstock, Illinois 60098
Contact:
Henry Boi

The Illinois Vegetable Growers Association speaks to consumers on the benefits of Illinois grown produce; legislators on the special needs of the vegetable industry; and growers to pinpoint common interests.

9. Illinois Landscape Contractors Association
4A E. Wilson
Batavia, Illinois 60510
Contact: Lucile Little
(312) 879-5566

The Illinois Landscape Contractors Association was begun in 1959 to provide a forum for the exchange of ideas among landscape contractors and in serving the industry and the public through instructional meetings, seminars, short courses, field trips, and publications.

ILCA publishes a reference manual, membership directory and monthly magazine. Other activities include:

1. Annual summer field day
2. Short courses ranging from topics such as plant identification, landscape design, maintenance and weed control
3. Co-sponsor of Mid-American Trade Show
4. Two permanent scholarships and several general scholarship awards depending on how many students apply.

10. Florafax
4175 S. Memorial
Tulsa, Oklahoma 74112
Contact:
Tamara Logue, Editor
(918)622-8415 ext. 294

The Florafax publication is entitled Design for Profit. The cost is $18.00 per year (4 issues) or $5.00 per copy.

11. Florascope
P.O. Box 44
Glen Ellyn, Illinois 60137
Contact:
Mary Lu Parks, Publisher
(312)858-6331

Florascope is a floriculture newsletter for growers which speaks to aspects of floriculture marketing such as consumer trends, new products, public relations and promotion.

12. American Vegetable Grower
37841 Euclid Avenue
Willoughby, Ohio 44094

Contact:
Stella Kovalchuk, Associate Editor
(216)942-2000

Departments in this monthly magazine include trends, forecasts, state news, et cetera. Subscriptions are currently $10.00 per year. A separate Greenhouse Grower is about to be published.

ADDITIONAL TRADE ORGANIZATIONS AND PUBLICATIONS

1. American Floral Services
P.O. Box 12309
Oklahoma City, Oklahoma 73157

2. Florist Transworld Delivery Association
2400 Northwestern Highway
Southfield, Michigan 48075

3. Bedding Plant News
2043 Hamilton Rd.
P.O. Box 286
Okemos, Michigan 48864

4. American Horticulturist
7931 E. Boulevard Dr.
Alexandria, Virginia 22308

5. Nursery Business
805 Elm Grove Road
Elm Grove, Wisconsin 53122

6. Landscape Contractor
4 A. East Wilson
Batavia, Illinois 60510

7. Floral and Nursery Times
2200 W. Touhy Suite 3
Chicago, Illinois 60645

8. Garden Supply Retailer
Miller Publishing Company
P.O. Box 67
Minneapolis, Minn. 55440

9. American Nurseryman
American Nurseryman Publishing Co.
310 South Michigan Avenue
Suite 302
Chicago, Illinois 60604
(312)922-9011

10. Greenhouse Manager
Branch-Smith Publishing
120 St. Louis Avenue
Fort Worth, Texas 76104
1-800-722-5851

11. Florists' Review
Florist's Publishing Company
310 South Michigan Avenue
Suite 302
Chicago, Illinois 60604
(312)922-8194

12. Grounds Maintenance
Intertes Publishing Corporation
9221 Quivire Road
Overland Park, Kansas 66215

STUDENT WORKSHEET 1

HORTICULTURAL/AGRICULTURAL ORGANIZATION FACTS

OBJECTIVE:

1. to help the student identify a major horticultural organization or resource and its purpose.
2. to describe the activities within the organization and how the members benefit from them.

DIRECTIONS: Use these questions as a guideline, when contacting a horticultural/agricultural organization. Additional questions may be added.

Name of organization______________________________
Address__________________ City____________ State________
Name of contact person____________________________
Position within the organization________________________
Phone________________

1. Does this organization print informative materials? ____________
______ newsletter ________magazine_______ other (specify)
Cost?________ Requirement for mailing list?____________

2. Does this organization hold regular meetings?
When?________________ Where________________

3. Do you have student or associate memberships?
______yes ______no $_______ dues?

4. What are the goals or purposes of this organization?
____
____
____
____
____

5. What are the membership requirements?
____
____

6. What benefits do members receive by belonging to this organization?
____
____
____
____
____

7. How many members are currently enrolled in this organization?________

STUDENT WORKSHEET 2

INTERVIEWING A LOCAL AGRIBUSINESSPERSON

OBJECTIVES:

1. to help the student become familiar with a local agribusiness.
2. to help the student recognize the benefits of belonging to a horticultural/agricultural organization, or subscribing to a publication.

DIRECTIONS: Use this worksheet as a guideline when interviewing a local business person. Additional questions may be added.

Name of bussiness ____________________

Address ____________________ City ____________________

Name of contact person ____________________

Position within business ____________________

Date and time of interview ____________________

Suggested Questions:

1. What professional organizations do you belong to?

2. Are there any that do not pertain directly to horticulture/agriculture?

3. Why are non-horticultural/agricultural organizations important?

4. How do you become aware of the various organizations?

5. How do you and your business benefit from the organizations?

6. What publications do you subscribe to?

7. What type of information do these publications give you?

UNIT D: AGRICULTURAL/HORTICULTURAL MECHANICS

PROBLEM AREA: PLUMBING AND IRRIGATION SYSTEMS

SUGGESTIONS TO THE TEACHER:

This problem area is designed for eleventh-grade or advanced students in a horticultural occupations program. The recommended time for teaching this problem area is during the winter months when outdoor horticultural activities are limited.

The estimated instructional time for this problem area is 5-10 days, depending on how far the teacher wishes to develop skills in plumbing and selecting irrigation systems. If the teaching plan is limited to classroom discussion with little or no practice or observation, the instructional time can be three days or less. If the students are to be involved in other activities, the instructional time will need to be increased.

The instructor is encouraged to conduct a local search to locate other supplementary materials. The items in this problem area are for reference or modification as teachers adapt these materials to their local situation.

CREDIT SOURCES:

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The teacher's guide, information sheets, student worksheet, laboratory exercises, and sample test questions were developed by Susie Osborne, Department of Vocational and Technical Education, University of Illinois. Transparency masters were prepared by the Vocational Agricultural Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Metropolitan Core Curriculum Field Test Teachers and Paul Hemp, Division of Agricultural Education, University of Illinois.

TEACHER'S GUIDE

I. Unit: Agricultural/horticultural mechanics

II. Problem area: Plumbing and irrigation systems

III. Objectives: At the close of this problem area students will be able to:

1. Identify different types of pipe and pipe fittings.
2. Identify and safely use various plumbing tools.
3. Cut, ream, thread and/or join galvanized steel, copper and plastic pipe.
4. Repair dripping faucets, leaking pipes, frozen pipes and clogged drains.
5. Determine the need for irrigation.
6. Identify the major types of irrigation systems and their advantages.
7. Identify the types of water sprinkler heads and describe their uses.
8. Select proper irrigation systems.

IV. Suggested interest approaches:

1. Display galvanized steel, copper, and plastic pipe and pipe fittings. Have the class try to locate where the various types of pipe and pipe fittings are used in the greenhouse and the reasons for their location.
2. Ask the students if they have encountered dripping faucets, leaking pipes, frozen pipes or clogged drains in their homes. Have the students explain how these problems were solved.
3. Measure and record the wetting pattern of various types of sprinklers (See Laboratory Exercise 2 - Sprinkler Wetting Patterns.).
4. Have students determine available soil moisture with a tensiometer, by weighing a soil sample before and after drying, or by using the "feel method." (Refer to Information Sheet 1 -Factors to Consider when Determining Irrigation Needs, Part IV, Section C-2).

V. Anticipated problems and concerns of students:

1. What types of pipe and pipe fittings are available and when are they used?

2. What types of tools are used in plumbing?

3. How do you cut, ream, thread, and/or join galvanized steel, copper, and plastic pipe?

4. How do you repair dripping faucets, leaking pipes, frozen pipes, and clogged drains?

5. How do you determine whether irrigation is needed?

6. What are the advantages and disadvantages of the major types of irrigation systems?

7. What types of water sprinkler heads are available and when are they used?

8. How do you select the proper irrigation system?

VI. Suggested learning activities and experiences:

1. Have students read VAS Subject Matter Unit 3056 - Designing, Installing and Repairing Plumbing Systems and answer the questions on Student Worksheet 1 - Plumbing.

2. Have students identify the different types of pipe, pipe fittings and plumbing tools utilizing the transparencies included in this problem area. The transparencies can also be made into student worksheets. Use the transparency discussion guide as a key.

3. Demonstrate how to measure, cut, ream, thread, and/or join galvanized steel, copper, and plastic pipe. Have students practice these procedures. (Refer to the transparencies included in this problem area.)

4. Demonstrate how to take a faucet apart to replace a washer. Have students practice.

5. Have students prepare a bill of materials, including estimated costs, for installing a plumbing/irrigation system in a sample greenhouse.

6. Demonstrate how leaking pipes, frozen pipes and clogged drains are repaired. Simulate these problems and have students practice troubleshooting the problems and making repairs. (Refer to VAS Subject Matter Unit 3056 - Designing, Installing, Maintaining, and Repairing Plumbing Systems, pages 29-36.)

7. Have students complete Laboratory Exercise 1 - Pipe Fitting with Steel Pipe.

8. Ask students if they irrigate their home lawns or gardens. If so, what method do they use to irrigate, and how do they determine when irrigation is needed. Distribute Information

Sheet 1 - Factors to Consider When Determining Irrigation Needs after students have brainstormed reasons for irrigation.

9. Discuss each type of irrigation system using Information Sheet 2 - Facts About Water Application Methods.

10. Make up hypothetical situations and have students determine if irrigation is needed and if so what system should be used.

11. Have students explore the school's horticultural facilities to identify where various types of sprinkler/irrigation systems are used and explain the reason why.

12. Have a nurseryperson, greenhouse manager, or fruit or vegetable producer talk to students regarding the irrigation systems used in their horticultural operations, including selection, installation, costs and maintenance.

13. Using hoses with different size diameters and lengths, measure the amount of time it takes to fill a five gallon can. Discuss the process of "downstepping" to maintain water pressure. Use the transparency entitled "Pressure Losses in Valves and Fittings" included in this problem area.

14. Utilize the transparencies included in this problem area to identify and discuss the types of sprinkler heads and watering tools.

VII. Application procedures:

1. Students will be able to make minor plumbing repairs at home, school or on the job.

2. Information obtained in this problem area will enhance the student's ability to communicate plumbing/irrigation installation, maintenance and repair needs with a professional plumber.

3. Students will be able to use the information in this problem area when determining the need for irrigation and selecting the proper irrigation system.

VIII. Evaluation:

1. Administer a written test using the sample test questions included in this problem area.

2. Grade student worksheet.

3. Grade laboratory exercises.

IX. References and aids:

1. Vocational Agriculture Service, University of Illinois, 1401 South Maryland Drive, Urbana, Illinois 61801.

   A. Subject Matter Unit 3056 - Designing, Installing, and Repairing Plumbing Systems

   B. Slidefilm 480 - Identification of Pipe Fittings

   C. Transparencies T617.2 - Landscape Construction (Selected transparencies are included in this problem area.)

2. Planning for an Irrigation System available from American Association for Vocational Instructional Materials (AAVIM), Engineering Center, Athens, Georgia 30601.

3. Horticulture II, A Curriculum Manual, New Mexico State Department of Education.

4. Landscape Irrigation, California Vocational Agriculture Curriculum Guidelines.

INFORMATION SHEET 1

FACTORS TO CONSIDER WHEN DETERMINING IRRIGATION NEEDS

I. What effect will irrigation have on crop production?

   A. Will crop yields increase with additional water?

   B. Can an irrigation system be operated satisfactorily (Consider land topography, obstructions, drainage and soil characteristics.)?

   C. What fringe benefits can be obtained through irrigation (i.e., protection of crops from frost, cooling crops in hot weather, distribution of pesticides, control of harvest dates)?

II. How much water will be needed?

   A. How much water does the crop use during a season (seasonal water demand)?

   B. How much water does the crop need per day during its fastest growing period (peak-use water)?

III. What are the available irrigation water sources?

   A. Are streams, lakes, ponds, reservoirs, community pipelines, canals and wells available for irrigation purposes?

   B. What are the local laws controlling the use of water sources?

   C. How far is the water source from the crop?

   D. What is the height from the water to the pump and from the pump to the crop?

   E. What is the quality of the water (chemical content, salts, chlorine, boron, industrial wastes, organic acids and stains, trash, dirt or silt).

IV. How much water is available?

   A. What is the average yearly amount and timeliness of rainfall?

   B. What is the consumptive-use (effectiveness) of rainfall?

      1. Calculated from meterological and climatological data.

      2. Varies with temperature, humidity, wind, hours of sunshine, amount of plant cover and stage of development, and available moisture.

      3. Depends on intensity and amount of rainfall in relation to temperature and absorbing capacity of soil.

C. How much moisture is in the soil?

1. Can be determined by using a tensiometer, sorption block, weighing soil before and after oven drying, or by the following "feel method".

2. The accuracy of the feel method of evaluating soil moisture varies according to the condition of the soil and the person making the test. Use the following chart to determine soil moisture by the "feel method".

FEEL OF SOIL BETWEEN THUMB AND FOREFINGER	DEGREE OF MOISTURE
Powder dry	Dry
Crumbly, will not form a ball	Low (critical)
Forms a ball, but will crumble upon being tossed several times.	Fair (usual time to irrigate)
Forms a ball that will remain intact after being tossed five times, will stick slightly with pressure	Good
Forms a durable ball and is pliable; sticks readily; a sizable chunk will stick to the thumb after soil is squeezed firmly.	Excellent
With firm pressure can squeeze some water from the ball.	Too wet

INFORMATION SHEET 2

FACTS ABOUT WATER APPLICATION METHODS

I. Sprinkler Irrigation Method

- A. Background Information:
  - 1. Practical in humid climates
  - 2. Water distributed by
    - a. nozzles
    - b. perforated pipe
    - c. rotating sprinkler heads-applies water to circular areas at rates of 0.2 to 1.0 inch per hour; overlap for proper coverage is usually ¼ to ½ of the wetted circle.
- B. Advantages:
  - 1. Application rate can be controlled.
  - 2. Allows for even application.
  - 3. Water is used more efficiently.
  - 4. Reduces runoff, erosion, and disturbed soil conditions.
  - 5. Can be used on level areas and steep terrains.
  - 6. Allows full use of land because permanent distribution installations are not required.
  - 7. Lower labor cost to operate.
  - 8. Adaptable to any soil intake rates.
  - 9. Adaptable to most crops.
- C. Disadvantages:
  - 1. Initial costs are high.
  - 2. Power requirements are high. Water pressures of 15-100 lbs. per square inch must be maintained.
  - 3. Wind can affect application efficiency by disturbing the sprinkler patterns resulting in uneven water distribution.
  - 4. Evaporation can cause high water losses.

5. May promote fungi and disease on foliage and fruit.

II. Surface Irrigation Methods

A. Background Information:

1. Mostly used in arid and semi-arid regions.

2. Conveyed to fields in open ditches or tiles at a slow speed.

3. Water distributed by:

a. Flood Irrigation - entire field is covered in a continuous sheet; commonly used for crops that tolerate excessive water.

b. Furrow Irrigation - efficient in water utilization; requires high labor costs.

c. Soaker Irrigation - used on rolling land and closely growing crops; can be used in home gardens and greenhouses.

B. Advantages:

1. Pipelines may be used eliminating water loss due to seepage and evaporation.

2. Requires less power requirements than other methods.

3. Water loss by evaporation is minimal.

C. Disadvantages:

1. Land area must be leveled or graded to limited slopes or contours (0 to 1.0% slopes for most systems).

2. Not recommended for soils with high intake rates of more than 2.5 inches per hour or low intake rates such as peats and mucks.

3. Too rapid a flow will cause erosion and/or excessive leaching of water-soluble nutrients.

4. Drainage canals must be provided to prevent ponding.

5. May be harmful to root crops and plants that cannot tolerate water standing on roots.

6. Plants close to the source tend to receive more water because irrigation depends on gravity flow.

7. Can have negative effect on soil structure.

8. Can result in loss of soil aeration and cracking and baking of soil when it dries out, because of the possibility of puddling.

III. Subsurface Irrigation Method:

A. Background Information:

1. Involves creating and maintaining an artifical water table.

2. A distribution of main and lateral ditches permits the artificial water table to be raised or lowered by pumping water into or out of the system.

3. Most favorable growth is achieved when water table is 24-36 inches below the soil surface (tolerance varies with plant).

4. Consistency and quality of organic soil lessens as the water table drops.

5. A barrier such as an impervious layer must be available to prevent the loss of water laterally and vertically.

B. Advantages:

1. Efficient use of water.

2. Evaporation loss is minimal.

3. Power requirements are minimal.

4. No adverse effects from wind action.

C. Disadvantages:

1. Land must be contoured.

2. Subsurface soil must be permeable enough to permit rapid movement of water laterally and vertically.

3. Unexpected rainfall can cause flooding and intensive crop damage unless the water table can be lowered quickly.

4. Can be utilized only in a very selective area.

5. Can result in a soluble buildup.

6. May retard germination of shallow planted seed.

IV. Trickle Irrigation System

A. Background Information:

1. Consists of network of water-conducting plastic tubes with individual lines feeding each pot.

2. Each tube may end in a valve permitting individual control and is weighted to keep it in the pot.

3. Automation device may consist of scale to weigh the pot.

4. Examples of uses include pots in greenhouses, tree crops, and spaced vegetable crops.

B. Advantages:

1. Entire system can be automated for watering and fertilization of the plant.

2. Tubes can be disconnected and plugged for individual plant requirements.

3. Provides uniform watering and fertilization.

4. Less evaporation occurs in arid regions, so less salt accumulates on the soil surface.

5. Salts can be leached out with high concentration of water around the individual plant.

6. Conserves water by restricting it to the root zone in spaced plantings.

C. Disadvantages:

1. Tubes may become plugged.

2. Installation is costly.

3. Tubes can come out of pots easily.

STUDENT WORKSHEET 1

PLUMBING

Reference - VAS Subject Matter Unit 3056 - Designing, Installing, Maintaining and Repairing Plumbing Systems.

1. How can high water pressure be maintained throughout a water supply system?

2. What types of pipe are suitable for supply lines?

3. What are pipe fittings?

4. What will happen if a pipe is not reamed after cutting?

5. How are galvanized steel, copper and plastic pipe usually joined to fittings?

STUDENT WORKSHEET 1 - Continued

6. How can clogged drains be prevented?

7. Name two types of faucets.

8. What usually causes small leaks in pipes?

9. Name three methods of thawing frozen pipes.

10. What purpose does a "drain snake" serve?

LABORATORY EXERCISE 1

PIPE FITTING WITH STEEL PIPE

OBJECTIVES:

1. To develop the ability to measure, cut and ream steel pipe.

2. To develop the ability to identify and properly use pipe fitting tools and equipment.

3. To develop the ability to thread and assemble steel pipe.

MATERIALS:

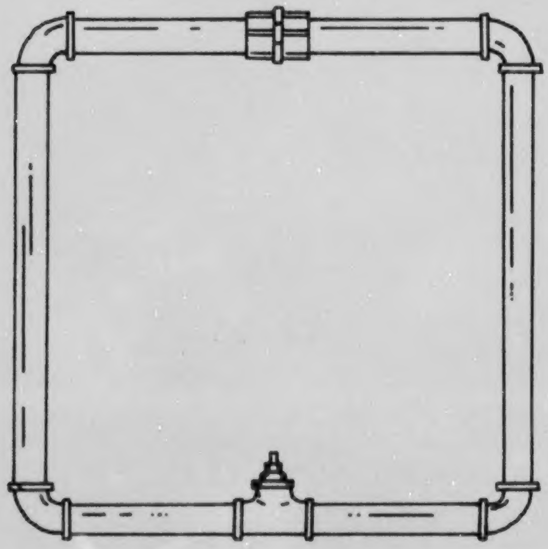
1. ½" steel pipe (2 piece approximately 24 inches long and 4 pieces 12 inches long)
2. 4-½" 90 degree elbows
3. ½" steel union
4. ½" X ½" X ½" steel tee
5. Pipe joint compound
6. Pipe fitting tools (cutter, pipe tap and die set, and reaming tools)
7. VAS Filmstrip 480, Identification of Pipe and Fittings

PROCEDURES:

1. Secure pipe in pipe vise and cut to proper length as suggested by the instructor.

2. Ream and thread the six pieces. Use cutting oil when necessary to avoid damaging the threads and dulling the pipe die.

3. Using pipe joint compound, assemble the pipe using pipe vise wrenches. The tee should be toward the inside.



4. Attach an air compressor hose connector to the tee, then attach the air compressor hose. Submerge the assembled pipe project under water and check for leaks.

QUESTION:

1. What precautions for use are listed on the pipe compound?

2. Why is it necessary to use pipe joint compound. And what types are commonly used?

3. How are pipe threads different from other threads?

4. How do you determine how far to thread the pipe?

OBSERVATIONS:

What safety precautions should you observe in pipe fitting. Briefly outline the technique used in cutting and threading a pipe.

APPLICATIONS:

How can you use these skills at home or with your S.O.E.P.?

LABORATORY EXERCISE 2

SPRINKLER WETTING PATTERNS

OBJECTIVE: To determine the type sprinkler best suited for a specific lawn area.

MATERIALS:

1. Hose and water source

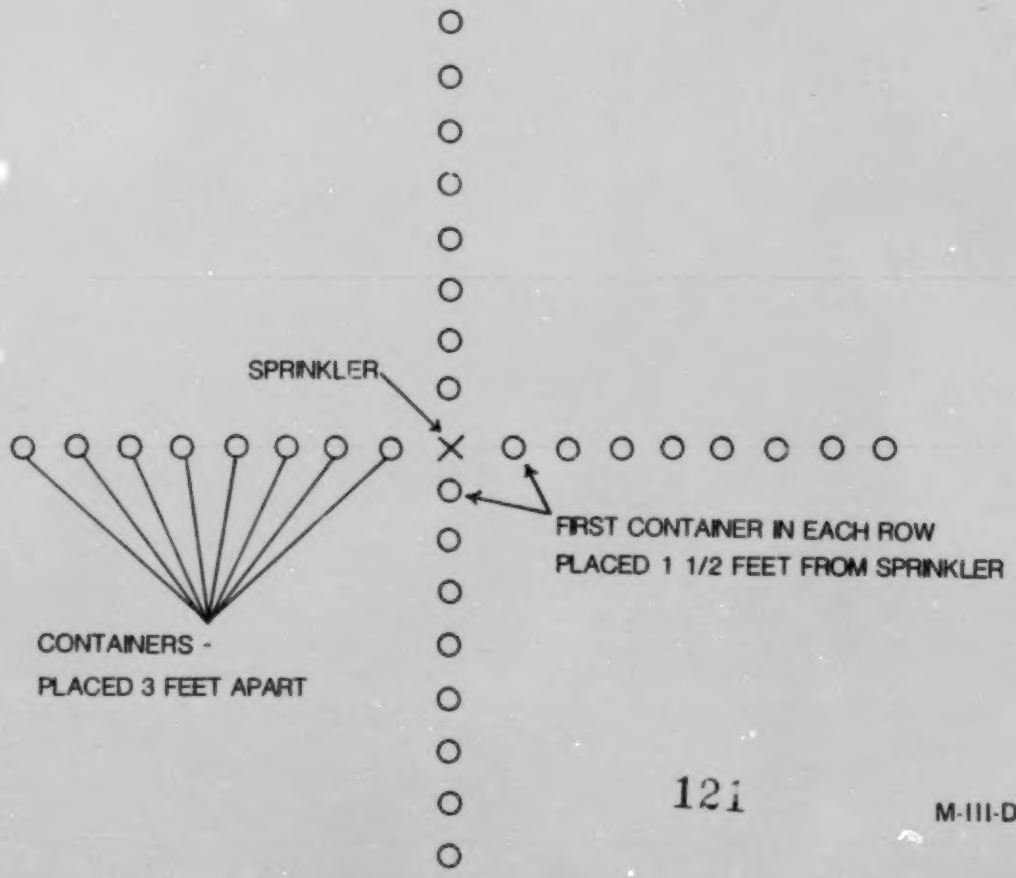
2. 32 equal sized containers (metal cans can usually be obtained from the school cafeteria)

3. Various types of sprinklers

    A. "Impulse" oscillating
    B. Round head
    C. Slowly revolving two armed jet
    D. "Owl eye"
    E. Nailhead fan

PROCEDURES:

1. Set the sprinkler (x), and arrange the containers as shown below. The first containers should be placed 1½ feet from the sprinkler and the rest 3 feet apart. Number each container.


SPRINKLER
FIRST CONTAINER IN EACH ROW
PLACED 1 1/2 FEET FROM SPRINKLER
CONTAINERS -
PLACED 3 FEET APART

2. Turn on the water until each container reached by the sprinkler has at least ½ inch of water in it.

3. Turn off the water. Measure and record the depth of water in each container with a ruler or yardstick.

4. Repeat the procedure with each available type sprinkler. (Be sure the water pressure and wind effects are the same for each test.)

5. Prepare a chart indicating the amount of water collected in each container for each sprinkler.

OBSERVATIONS:

TEACHER'S KEY - STUDENT WORKSHEET 1

PLUMBING

Reference - VAS Subject Matter Unit 3056 - Designing, Installing, Maintaining, and Repairing Plumbing Systems

1. How can high water pressure be maintained throughout a water supply system?

   Water pressure can be maintained by designing and running supply lines as short and direct as possible, using a minimum number of fittings, and selecting the proper size pipe.

2. What types of pipe are suitable for supply lines?

   PVC and CPVC plastic, copper, and galvanized iron pipe are suitable for supply lines.

3. What are pipe fittings?

   Pipe fittings are used to join two pieces of pipe together.

4. What will happen if a pipe is not reamed after cutting?

   Failure to ream the pipe after cutting will cause a reduced carrying capacity for the pipe. It can also cause impurities to gather and clog pipes.

5. How are galvanized steel, copper and plastic pipe usually joined to fittings?

   Galvanized steel pipe is threaded and screwed onto threaded fittings using a joint sealer to prevent leaks. Copper pipe is usually soldered to the fittings. Most types of plastic pipe are cemented to their fittings.

6. How can clogged drains be prevented?

   Clogged drains can be prevented by keeping solid materials from entering drains, using a commercial drain cleaner on a regular schedule, keeping the pop-up part of the sink drain clean, and by occasional cleaning of the sink trap cleanout plug.

7. Name two types of faucets.

   Faucets come in either a washer or washerless design.

8. What usually causes small leaks in pipes?

   Small leaks in pipes are usually caused by corrosion or by damaged or poorly fitting joints.

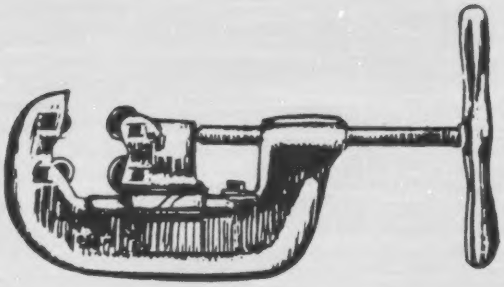
9. Name three methods of thawing frozen pipes.

Frozen pipes can be thawed by heating with a propane torch, heat lamp or with electrical resistance from an arc welder. Frozen pipes can also be wrapped with rags and thawed by pouring boiling water over the rags.

10. What purpose does a "drain snake" serve?

A drain snake is used to clear clogged drains.

PIPE CUTTING TOOLS



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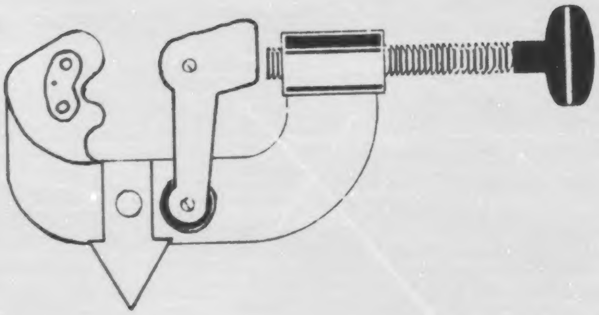

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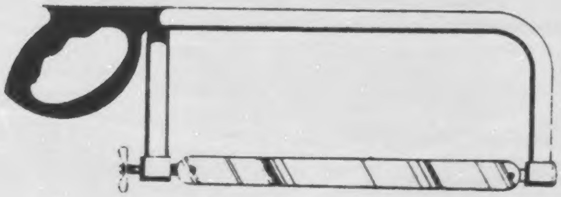

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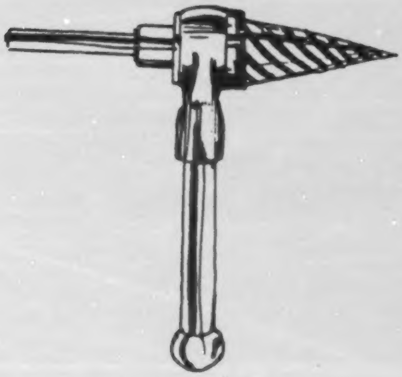
PLUMBING TOOLS



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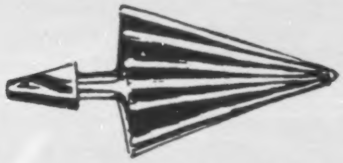

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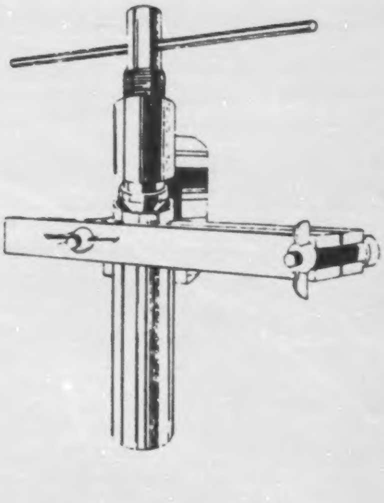

PLUMBING TOOLS (Continued)

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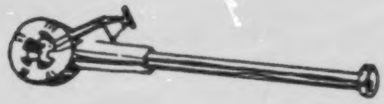

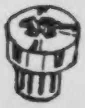

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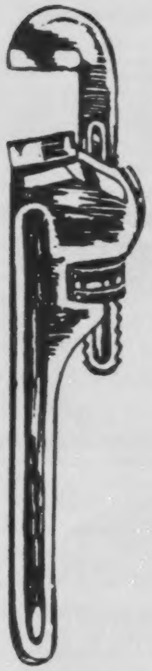

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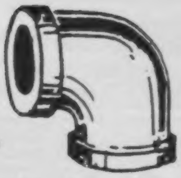
COMMON PIPE FITTINGS



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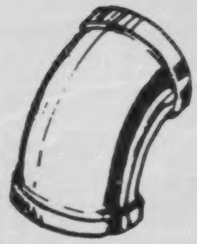

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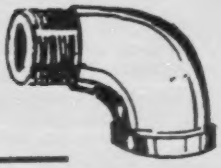

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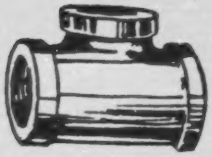

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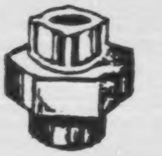

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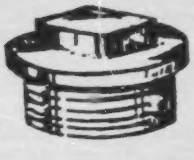

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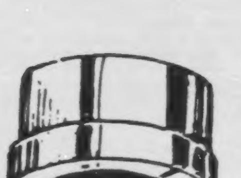

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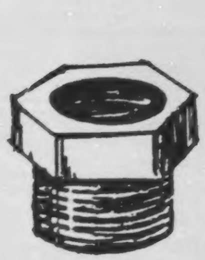

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COMMON PIPE FITTINGS
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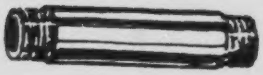

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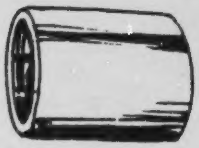

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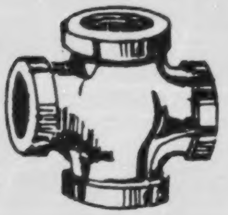

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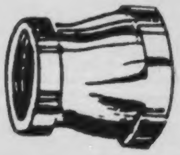

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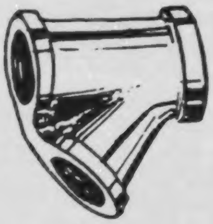

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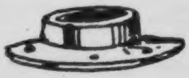

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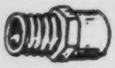

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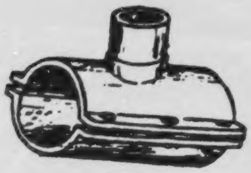

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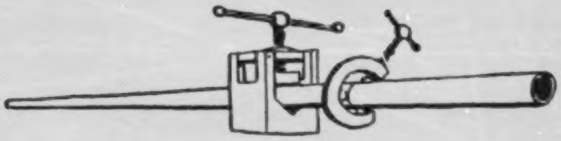
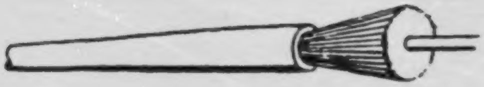
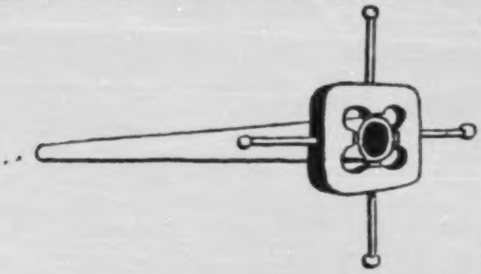
GALVANIZED STEEL PIPE



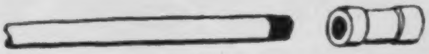
WITH PIPE IN VISE, CUT TO LENGTH WITH PIPE CUTTER



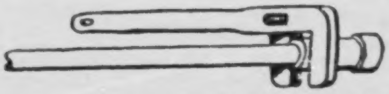
REAM INSIDE OF CUT END TO FULL OPENING



CUT THREADS USING STANDARD IPS PIPE DIES

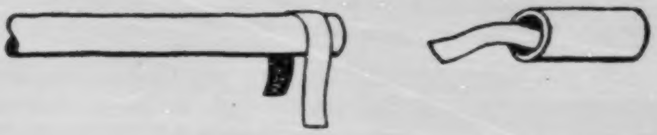


APPLY PIPE JOINT COMPOUND TO THREADS OF PIPE ONLY

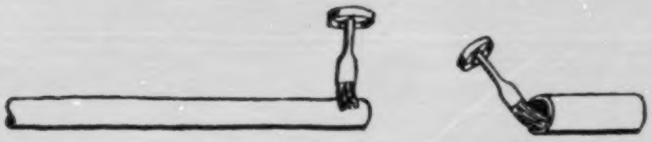


SCREW TOGETHER AND TIGHTEN WITH PIPE WRENCH

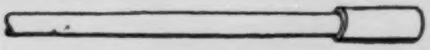
COPPER PIPE



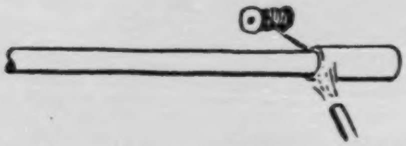
CLEAN PIPE AND FITTING WITH EMERY CLOTH



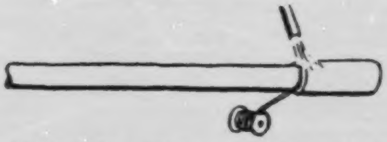
APPLY FLUX TO OUTSIDE OF PIPE, INSIDE OF FITTING



PUSH PIPE INTO FITTING SOLIDLY AGAINST STOP

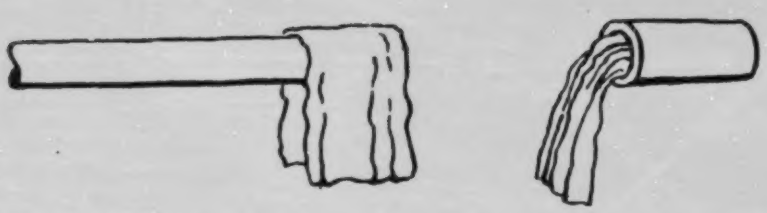


HEAT FITTING UNTIL SOLDER MELTS AND FLOWS FREELY

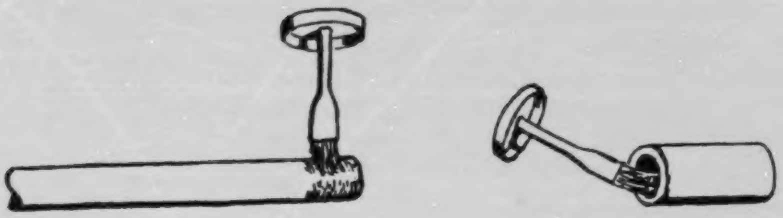


CONTINUE HEAT, FILL JOINT COMPLETELY WITH SOLDER

PLASTIC PIPE



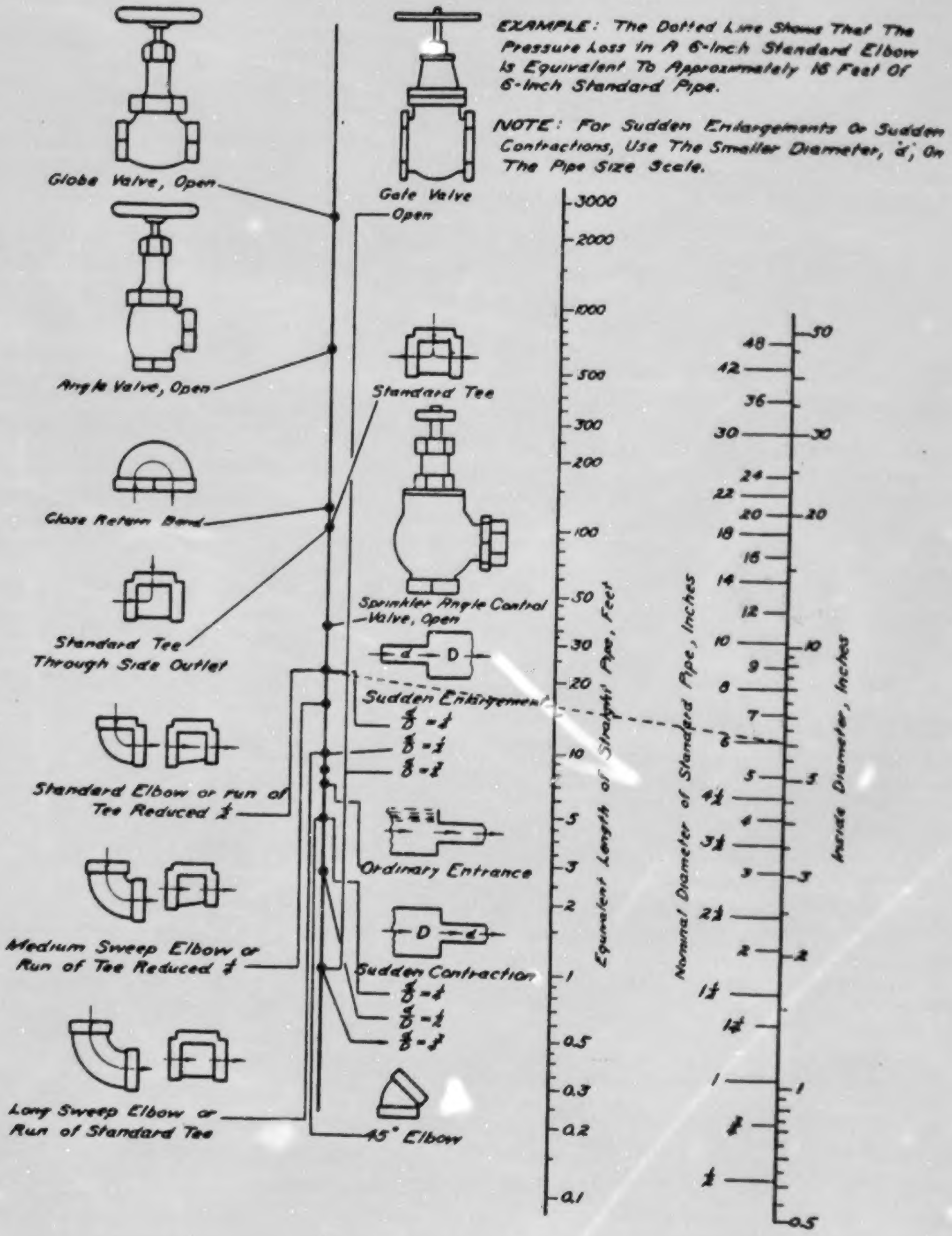
PIPE AND FITTING MUST BE WIPED CLEAN AND DRY



APPLY SOLVENT TO OUTSIDE OF PIPE, INSIDE OF FITTING

PUSH PIPE AGAINST STOP AND TWIST ¼ TURN

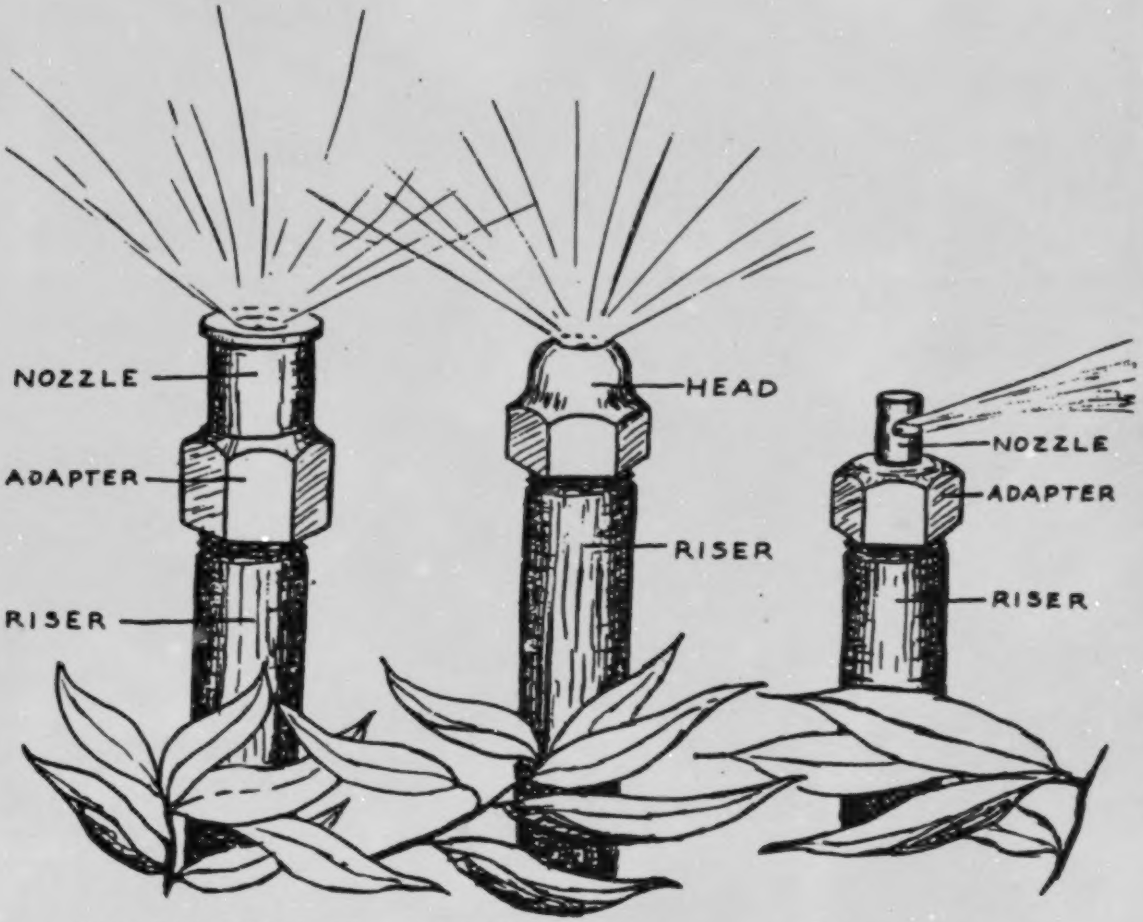
PRESSURE LOSSES IN VALVES AND FITTINGS



EXAMPLE: The Dotted Line Shows That The Pressure Loss In A 6-Inch Standard Elbow Is Equivalent To Approximately 16 Feet Of 6-Inch Standard Pipe.

NOTE: For Sudden Enlargements Or Sudden Contractions, Use The Smaller Diameter, 'd', On The Pipe Size Scale.

SHRUB SPRINKLER HEADS

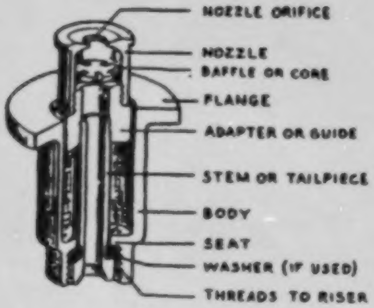

NOZZLE
ADAPTER
RISER
HEAD
RISER
NOZZLE
ADAPTER
RISER

POP-UP NOZZLE WITH ADAPTER

ONE PIECE FULL CIRCLE

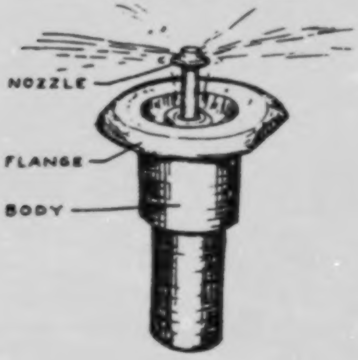
TWO PIECE PART CIRCLE

POP-UP SPRINKLER HEADS

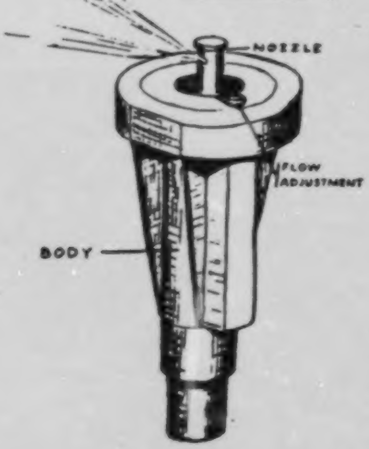

NOZZLE ORIFICE
NOZZLE
BAFFLE OR CORE
FLANGE
ADAPTER OR GUIDE
STEM OR TAILPIECE
BODY
SEAT
WASHER (IF USED)
THREADS TO RISER

TYPICAL CONSTRUCTION OF POP-UP SPRAY HEAD

PENDULUM ACTION POP-UP

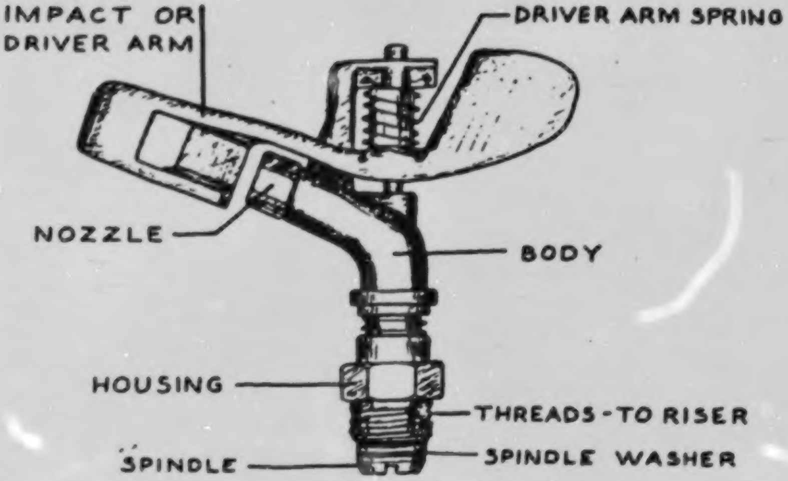

NOZZLE
FLANGE
BODY

PULSATING SPRAY POP-UP

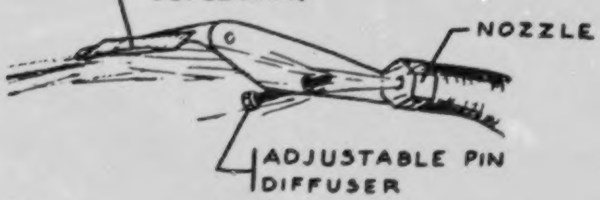

NOZZLE
FLOW ADJUSTMENT
BODY

IMPACT DRIVE SPRINKLER HEAD

ABOVE GROUND ROTARY SPRINKLER
IMPACT DRIVE

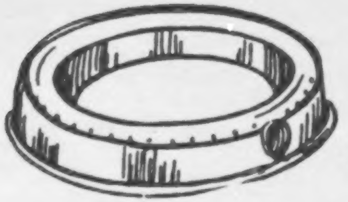

IMPACT OR DRIVER ARM
DRIVER ARM SPRING
NOZZLE
BODY
HOUSING
THREADS-TO RISER
SPINDLE
SPINDLE WASHER

FULL CIRCLE

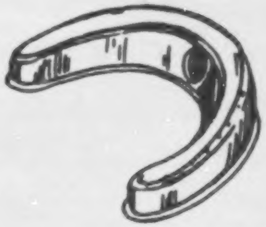

DEFLECTOR
NOZZLE
ADJUSTABLE PIN
DIFFUSER

OPTIONAL ATTACHMENTS

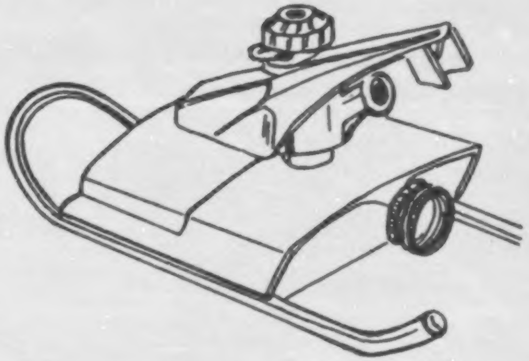
WATERING TOOLS A.



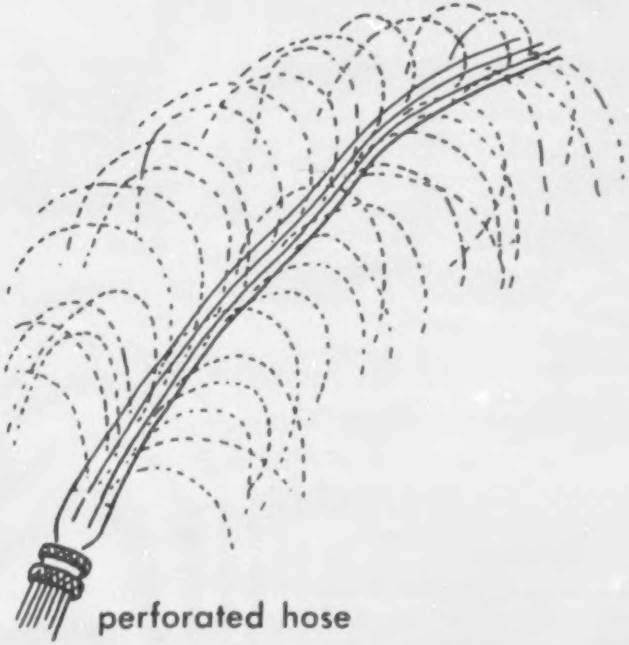
ring



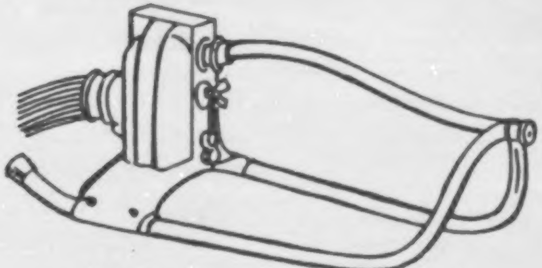
half-ring



pulsator



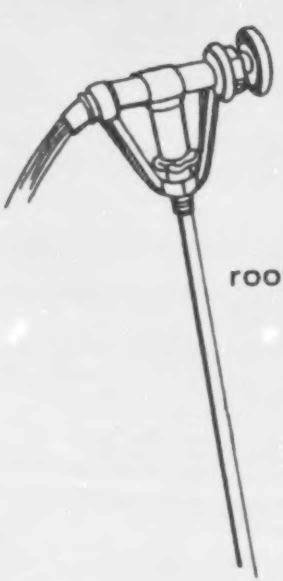
perforated hose

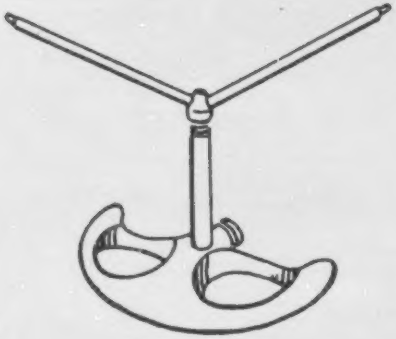


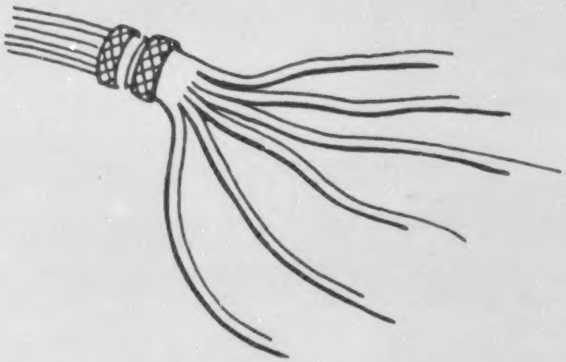
oscillating

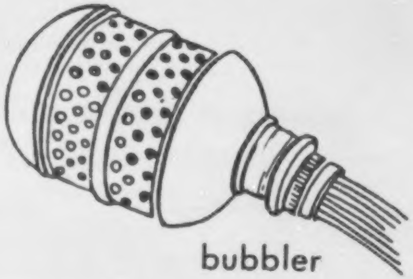
M-III-D-1-34

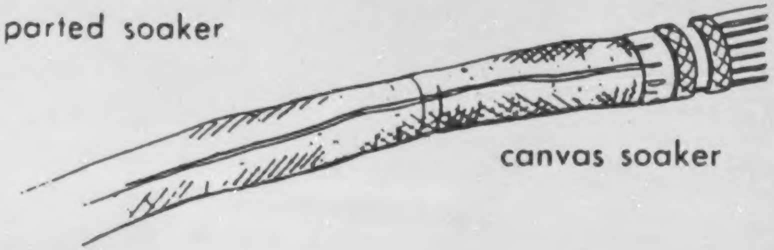
WATERING TOOLS B.


root feeder

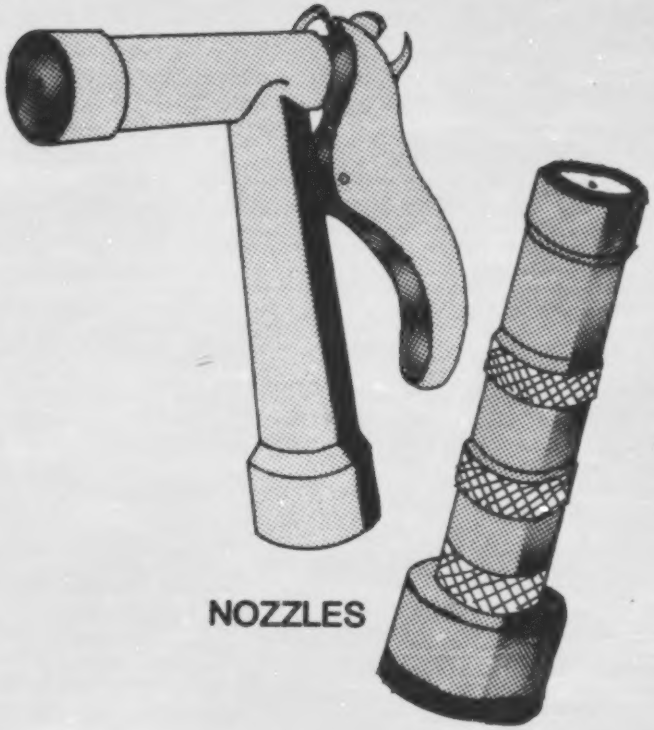

revolving jet


6-parted soaker

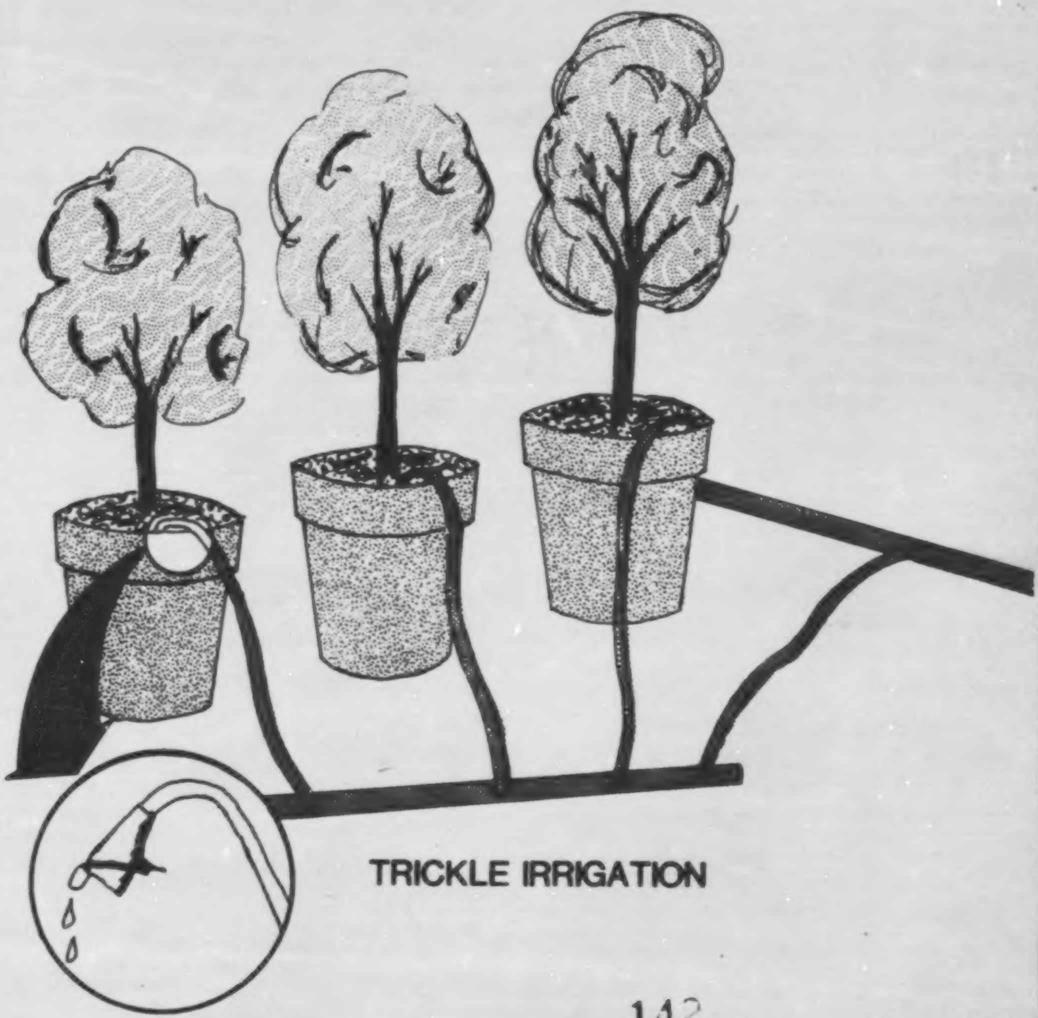

bubbler


canvas soaker

WATERING TOOLS C.



NOZZLES



TRICKLE IRRIGATION

AUTOMATIC GREENHOUSE WATERING SYSTEMS

A. OVERHEAD–Water applied to soil surface

1. Hand–held hose
2. Skinner systems–perforated pipe that produces a fine spray
3. Soakers
4. Trickle system–plastic hoses to each pot
5. Gates system–small spray nozzle on perimeter of bench

B. SUBSURFACE IRRIGATION–
Water applied under soil surface

1. Water is introduced onto a tile line or perforated pipe located in the bottom of a watertight bench.
2. Watertight bench where pots are located is flooded.
3. Water moves upward into the root zone by capillary action.

TRANSPARENCY DISCUSSION GUIDE

PLUMBING AND IRRIGATION SYSTEMS

I. Transparency--PIPE CUTTING TOOLS

A. Have students identify the following items.

1. Pipe cutter
2. Tubing cutter
3. Hacksaw

II. Transparency--PLUMBING TOOLS

A. Have students identify the following items:

1. Spiral ratchet pipe reamer
2. Burr reamer
3. Flaring tool
4. Spiral ratchet threader
5. Die
6. Pipe wrench

III. Transparency--COMMON PIPE FITTINGS

A. Have students identify the following pipe fittings:

1. 90° elbow
2. 45° elbow
3. 90° street elbow
4. Tee
5. Union
6. Plug
7. Cap
8. Bushing
9. Nipple
10. Coupling
11. Straight cross
12. Bell reducer
13. "Y"
14. Floor flange
15. Adapter
16. Clamp saddle

IV. Transparency--JOINING PIPE

A. Use these transparencies when explaining plumbing in the classroom, and/or as supplementary visuals when demonstrating the procedures.

B. Point out the differences and similarities when cutting, reaming, threading and/or joining galvanized steel, copper, and plastic pipe.

V. Transparency--PRESSURE LOSSES IN VALVES AND FITTINGS

A. This transparency illustrates the pressure loss occurring in various types of water valves and fittings. The transparency consists of three parts: (1) illustrations of water valves and fittings with each indicated by a dot along a vertical line, (2) a scale showing pipe length, and (3) a scale showing pipe diameter.

B. This transparency does not indicate the exact amount of pressure loss. Instead, the length of pipe can be determined that would would have approximately the same pressure loss as a specific valve or fitting.

C. To use the transparency, find the valve or fitting being used and locate its dot along the vertical line. Then, using the right hand scale, find the pipe diameter being used. Draw a line between the valve or fitting dot and the pipe size. Where the line crosses the middle scale indicates the length of pipe that would have the same pressure loss as the valve or fitting selected. See the examples below.

1. A 3 inch angle valve (open) causes the same pressure loss as 40 feet of 3 inch pipe.

2. A reduction in pipe size from a 4 inch pipe to a 2 inch pipe causes the same pressure loss as almost 2 feet of 2 inch pipe.

3. A 1 inch close return bend causes the same water pressure loss as 6 feet of 1 inch pipe.

VI. Transparency--TYPES OF SPRINKLER HEADS

A. Use these transparencies to illustrate the different types of sprinkler heads and their parts.

B. Discuss the advantages, disadvantages and major uses of each sprinkler head.

VII. Transparency--WATERING TOOLS

A. Use transparencies to illustrate the different types of watering devices.

B. Discuss when each type of system should be used, as well as the advantages and disadvantages.

VIII. Transparency--AUTOMATIC GREENHOUSE WATERING SYSTEMS

A. Have students brainstorm the advantages and disadvantages of each system.

B. Demonstrate the use of each system if possible.

SAMPLE TEST QUESTIONS AND TEACHER'S KEY

PLUMBING AND IRRIGATION SYSTEMS

SHORT ANSWER:

1. Why is it necessary to use pipe joint compound or teflon tape when joining pipe?

   -to prevent leaks
   -prevents pipes from seizing together thus allowing repairs

2. Why should pipe be reamed after cutting?

   -to prevent reduction of the pipes water carrying capacity
   -to eliminate burrs which can collect impurities and clog pipes

3. How can high water pressure be maintained throughout a water supply system?

   -run supply lines as short and direct as possible
   -use a minimum number of fittings
   -select the proper size pipe

4. What types of pipe are suitable for water supply lines?

   -PVC and CPVC plastic
   -copper
   -galvanized iron

5. Name 4 different kinds of watering tools.

   -canvas soaker
   -6-parted soaker
   -revolving jet sprinkler
   -root feeder
   -pulsator sprinkler
   -oscillating sprinkler
   -perforated hose
   -bubbler

MATCHING: Match the types of irrigation systems on the left with their description on the right.

C 1. Sprinkler

B 2. Surface

D 3. Subsurface

A 4. Trickle

A. Consists of network of water-conducting plastic tubes with individual lines feeding each pot.

B. Water distributed by flood, furrow, or soaker irrigation.

C. Can be used on steep terrains, prevents runnoff and erosion.

D. Involves creating and maintaining an artificial water table.

UNIT D: HORTICULTURAL/AGRICULTURAL MECHANICS

PROBLEM AREA: REPAIRING GREENHOUSE OR HORTICULTURAL EQUIPMENT

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with advanced students in a horticultural occupations program. The recommended time for teaching this problem area will vary depending upon the equipment being used during a particular season of the year.

The estimated instructional time for this problem area is 4 or 5 days, depending on the number of skills the teacher wishes to develop at the third year level. If the teaching plan is limited to classroom discussion with little or no practice or observation, the instructional time can be 2 days or less. If the students are to be involved in other exercises, the instructional time will need to be increased.

The major emphasis of this problem area is preventative repair or general maintenance of greenhouse/horticultural equipment, as a professional electrician/plumber would usually perform major repairs. The problem area is intended for students entering entry-level horticultural positions. In addition to the material in this problem area, instructors should refer to Metropolitan Core Curriculum I and II for information on horticultural mechanics such as glazing, small engines, et cetera.

The instructor is encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt this problem area to their local situation.

CREDIT SOURCES:

These materials were developed through a funding agreement, R-33-13-D-0362-466 with the Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Research and Development Section, 100 North First Street, Springfield, Illinois 62777. Opinions expressed in these materials do not reflect, nor should they be construed as policy or opinion of the State Board of Education or its staff.

The teacher's guide, information sheets, student worksheets, laboratory exercises, and sample test questions were developed by Kallie Grobstein, Department of Vocational and Technical Education, University of Illinois. Transparency masters were prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Metropolitan Core Curriculum Field Test Teachers.

TEACHER'S GUIDE

I. Unit: Horticultural/agricultural mechanics

II. Problem area: Repairing greenhouse or horticultural equipment

III. Objectives: At the close of this problem area students will be able to:

1. Identify various equipment utilized for environmental control in greenhouses.
2. Maintain greenhouse equipment.
3. Recognize malfunctioning equipment.
4. Adjust or regulate equipment to provide proper environment.

IV. Suggested interest approaches:

1. Ask the students if they have ever worked with horticultural or greenhouse equipment.
2. Have the students visit a school or local greenhouse and name as many types of greenhouse equipment as they can find using Student Worksheet 1--Greenhouse Equipment.
3. Invite a local greenhouse grower or florist as a guest speaker to discuss the work involved in maintaining a greenhouse.
4. Discuss the importance of heating and cooling systems in greenhouses.
5. Compare 2 sets of cuttings--1 set that was kept under a mist system and 1 set that was not. Discuss the method that was most successful.
6. Ask students if they use any timing devices in their homes and, if so, to identify what they are.

V. Anticipated problems and concerns of students:

1. How does a maximum-minimum thermometer differ from a regular thermometer?
2. Why are maximum-minimum thermometers used in greenhouses?
3. How do I set a time clock?
4. What kind of equipment does a time clock control?
5. How do I determine the proper setting for a thermostat?
6. What is a polyethylene convection tube? What is its purpose?

7. What types of watering systems are used in a greenhouse?

8. How do I check to make sure water is being distributed evenly?

9. What is a Chapin watering system?

10. What is a mist system?

11. How can mineral buildup affect greenhouse equipment?

12. How can light intensity be measured in a greenhouse?

13. How do I calculate the volume of space in a greenhouse? Why is this important?

14. Where can I locate additional information on the upkeep of greenhouse equipment?

15. Why is a ventilation system important in a greenhouse?

VI. Suggested learning activities and experiences:

1. Have students examine a heating system in a greenhouse. Locate the source of heat and trace its path throughout the greenhouse. Have the students identify the type of system used and locate the thermostat.

2. Visit a greenhouse that uses a hot water system for a heat source. Find out what type of fuel is used in the boiler, and how evaporated water is replaced in the pipes.

3. Compare the temperature between the flow and return pipes in a hot water system by holding an unmounted thermometer on the pipes. The flow temperature minus the return temperature should not exceed 20 percent of the flow temperature minus the air temperature.

4. Trace the air movement in a greenhouse by using the smoke from a bee smoker or a smoldering piece of rope. Drafty areas may be cause for poor plant growth.

5. Take class to the school greenhouse and record the temperature when arriving. Shut down the ventilation system and monitor the temperature change every 5 minutes for 30 minutes.

6. Use a light meter to compare the variation in light intensity both inside and outside the greenhouse. Take several readings during different times of the day and during a variety of weather conditions. If possible, take light readings in greenhouses constructed of various materials.

7. Take temperature readings with a maximum-minimum thermometer, both inside and outside the greenhouse over a period of several days. What results are observed?

8. Check the mist distribution system by placing equal-sized containers at measured points from the center of the bed. After 24 hours, measure the volume of water in each container.

9. Check the wooden structures in a greenhouse for rot, by testing their strength with a knife blade. If the blade penetrates the wood easily, this may indicate that a type of rot may be present. If wood needs to be replaced, redwood treated with copper naphthenate is recommended along with the use of galvanized nails.

10. Add additional insulation to your school greenhouse during the winter by adding a polyfilm covering to the greenhouse structure. Polyethylene, (PCV) vinyl, and mylar polyester are the most popular materials used.

11. In late spring take light readings in the greenhouse. Apply shade cloth to various crops if necessary. Make sure support wires are properly fastened to the superstructure.

12. Calculate the heating requirements for a greenhouse using Information Sheet 2--Calculating Heating Requirements.

13. Many expensive repairs can be avoided with a regular maintenance program. Make a list of the items that need to be checked on a regular basis. (Lab exercise #2 may assist you)

14. Fires are a possible hazard in many greenhouses. Use Information Sheet 3--Safety Checklist to determine any potential problems in your school or local greenhouse.

VII. Application procedures.

1. Information in this problem area will enable students to assist with the upkeep of greenhouses at school and/or work.

VIII. Evaluation:

1. Construct and administer a pencil and paper test using sample test questions included in this problem area.

2. Grade laboratory exercises and student worksheets.

IX. References and aids:

1. Hanan, J. J., Holley, W. D., Goldsberry, K. L., Greenhouse Management, Springer-Verlag, Berlin-Heidelberg-New York, 1978.

2. Florist Products Inc. Catalog. 2242 N. Palmer Dr., Schaumburg, IL 60195 (312)885-2242.

3. Lewis, C. The Greenhouse. Pergamon Press, Oxford, London, Edinburgh, New York, Paris, Frankfurt.

INFORMATION SHEET 1

SUPPLIERS OF GREENHOUSES AND EQUIPMENT

Due to specific differences between the name brands of greenhouse equipment, it may be necessary to contact specific manufacturers for the proper maintenance of greenhouse equipment. A partial list of manufacturers is provided below.

1. Aluminum Greenhouses, Inc.
   14615 Lorain Ave.
   Cleveland, Ohio 44111

2. W. Atlee Burpee Company
   Warminster, Penn. 18974

3. Florist Products, Inc.
   2242 N. Palmer Dr.
   Schaumburg, Ill. 60195

4. Ickes Braun Greenhouse Manufacturing Co.
   Box 47
   Deerfield, Ill. 60019

5. Lord & Burnham
   Des Plaines, Ill. 60018

6. National Greenhouse Co.
   Box 100
   Pana, Ill. 62557

7. Sturdi-Built Manufacturing Co.
   11304 S.W. Boones Ferry Road
   Portland, Oregon 97219

INFORMATION SHEET 2

CALCULATING HEATING REQUIREMENTS

Certain requirements exist for the amount of energy needed to heat a greenhouse. These requirements are given in British Thermal Units or BTU's. By calculating the number of BTU's per hour necessary to heat a greenhouse, the owner can decide: (1) what fuel to use, (2) if a crop will be profitable, and (3) what size structure to build.

The following formula is recommended by the U.S. Department of Agriculture:

(1) Growing temperature - Coldest outdoor temp. = Temperature difference

Unadjusted

(2) Temperature difference x Total glass area (sq. ft.) = total BTU's

Necessary

(3) Unadjusted total BTU's x Glass thickness factor = BTU output

STEPS FOR CALCULATING HEATING REQUIREMENTS:

(1) Calculate the difference between the temperature at which you want to grow your crop and the coldest possible temperature for your area.

Example: Desired growing temperature = 62°
Coldest temperature = -20°
Difference = 82°

(2) Multiply this figure by the total exposed square footage of glass or plastic on the greenhouse.

Example: Total area = 600 sq. ft.
600 sq. ft. x 82° = 49,200

(3) This figure must be adjusted according to the thickness of the glass or plastic in the greenhouse.

If a double layer is used multiply by .8
If a single layer is used multiply by 1.2

Example: 49,200 x .8 = 39,360 BTU's for a double layer

or

49,200 x 1.2 = 59,040 BTU's for a single layer

INFORMATION SHEET 3

SAFETY CHECKLIST

Possibility for fire and other accidents can be reduced by following these safety tips.

I. Clean environment inside and outside the greenhouse

_____ A. weeds
_____ B. lumber
_____ C. trash
_____ D. properly stored combustible liquids

II. Design

_____ A. design new facilities with fire control in mind
_____ B. use non-flammable materials when possible

III. Heating equipment

_____ A. check equipment before the heating season begins
_____ B. have inspectors check boilers regularly and point out potential trouble spots.
_____ C. do not "over use" space heaters.

IV. Electrical equipment

_____ A. do not "do-it-yourself" if you are not familiar with electrical equipment
_____ B. use weather proof materials in areas of high moisture

V. Shade cloth

_____ A. use non-flammable cloth. Standard black cloth is highly flammable.

VI. Smoking areas

_____ A. indicate no smoking areas with signs

VII. Employee awareness

_____ A. inform new employees of safety regulations
_____ B. conduct fire drills
_____ C. keep fire extinguishers in highly visible places

VIII. Maintenance

_____ A. follow a maintenance checklist to keep equipment in proper condition
_____ B. invite a local fire inspector to point out potential hazards in your greenhouse

STUDENT WORKSHEET 1

GREENHOUSE EQUIPMENT

Directions: Listed below are various types of greenhouse equipment. Place a checkmark next to the equipment you can locate in the greenhouse. Add additional equipment not listed on the sheet. Describe its use in the greenhouse, using a supply catalog if necessary.

EQUIPMENT	USE IN GREENHOUSE
1. Thermostat -	
2. Time clock -	
3. Mist system -	
4. Polyethylene convection tubes -	
5. Chapin watering system -	
6. Maximum-minimum thermometer -	
7. Aspen pad and fan cooling system -	
8. Boiler or heating system -	
9. Heating cables -	
10. Shade cloth -	

LABORATORY EXERCISE 1

RECORDING GREENHOUSE TEMPERATURE

OBJECTIVE: The proper temperature in the greenhouse is essential for maximum plant growth and disease control. By taking temperature readings on a maximum-minimum thermometer, one can properly adjust the heating/cooling and ventilation systems.

PROCEDURES:

1. Place a maximum-minimum thermometer in the center of a greenhouse. Make sure that it does not receive direct sunlight.
2. Place a second maximum-minimum thermometer outside the greenhouse and out of direct sunlight.
3. Read both thermometers daily (in the morning) and record the readings. You may wish to plot them on a graph.

OBSERVATIONS:

1. Compare the readings from inside and outside the greenhouse. Which one fluctuates more?
2. Close the ridge vents and watch the thermometer. Does the temperature rise quickly, slowly, or is there no change?

LABORATORY EXERCISE 2

MAINTENANCE CHECKSHEET

____ 1. Inspect accuracy of time clocks.

____ 2. Check steel parts for rust.

____ 3. Check glass or plastic for damage.

____ 4. Monitor watering systems for accuracy.

____ 5. Remove weeds and trash from under benches.

____ 6. Check wooden structures for rot and treat with preservative.

____ 7. Check electrical wiring insulation for cracks.

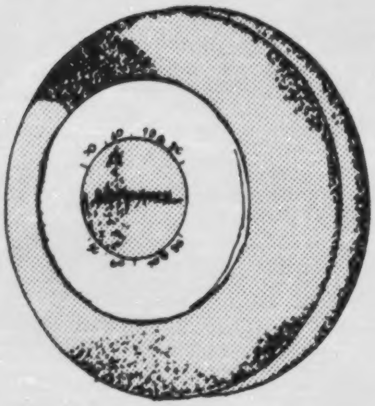
____ 8. Service heating system during the warm weather before you need it.

____ 9. Check misting heads for mineral buildup.

____ 10. Inspect ventilation system.

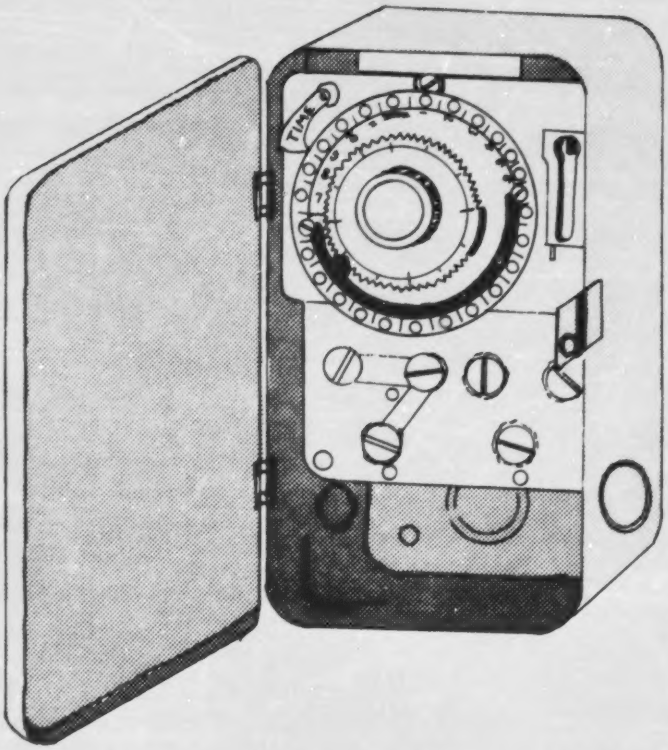
CONTROLS

THERMOSTAT

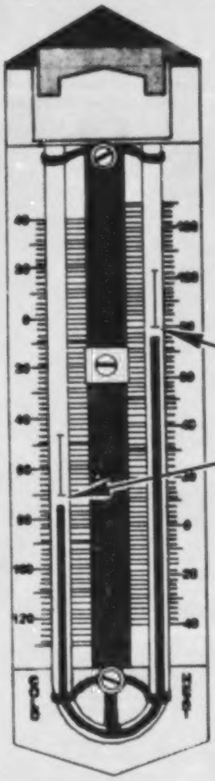


TIMING DEVICES

TIME CLOCK



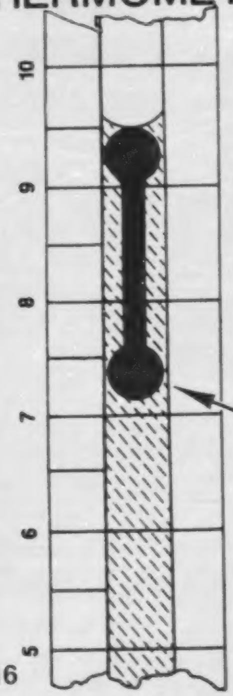
MAXIMUM–MINIMUM THERMOMETER



MAXIMUM AND MINIMUM TEMPERATURES ARE READ AT THE LOWER END OF THE INDEX

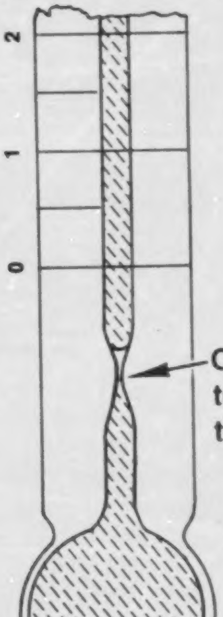
Reading taken here

MINIMUM THERMOMETER



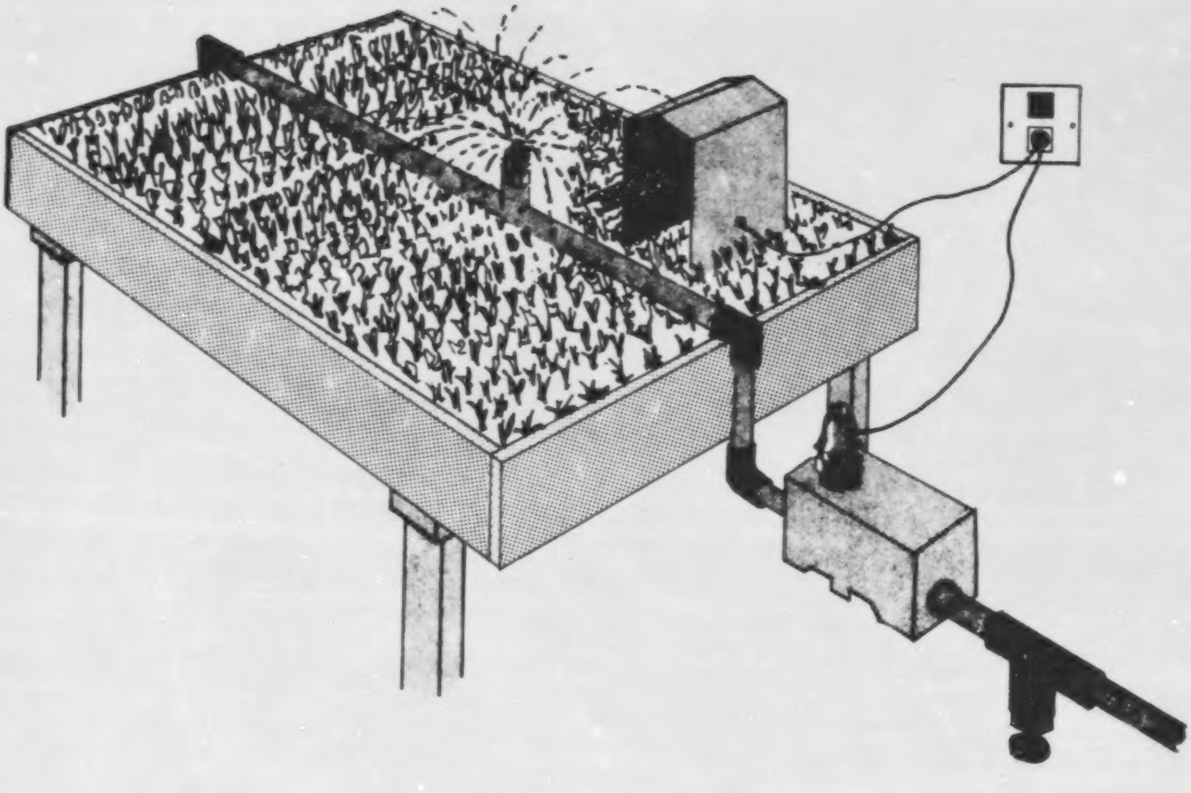
Reading taken here

MAXIMUM THERMOMETER

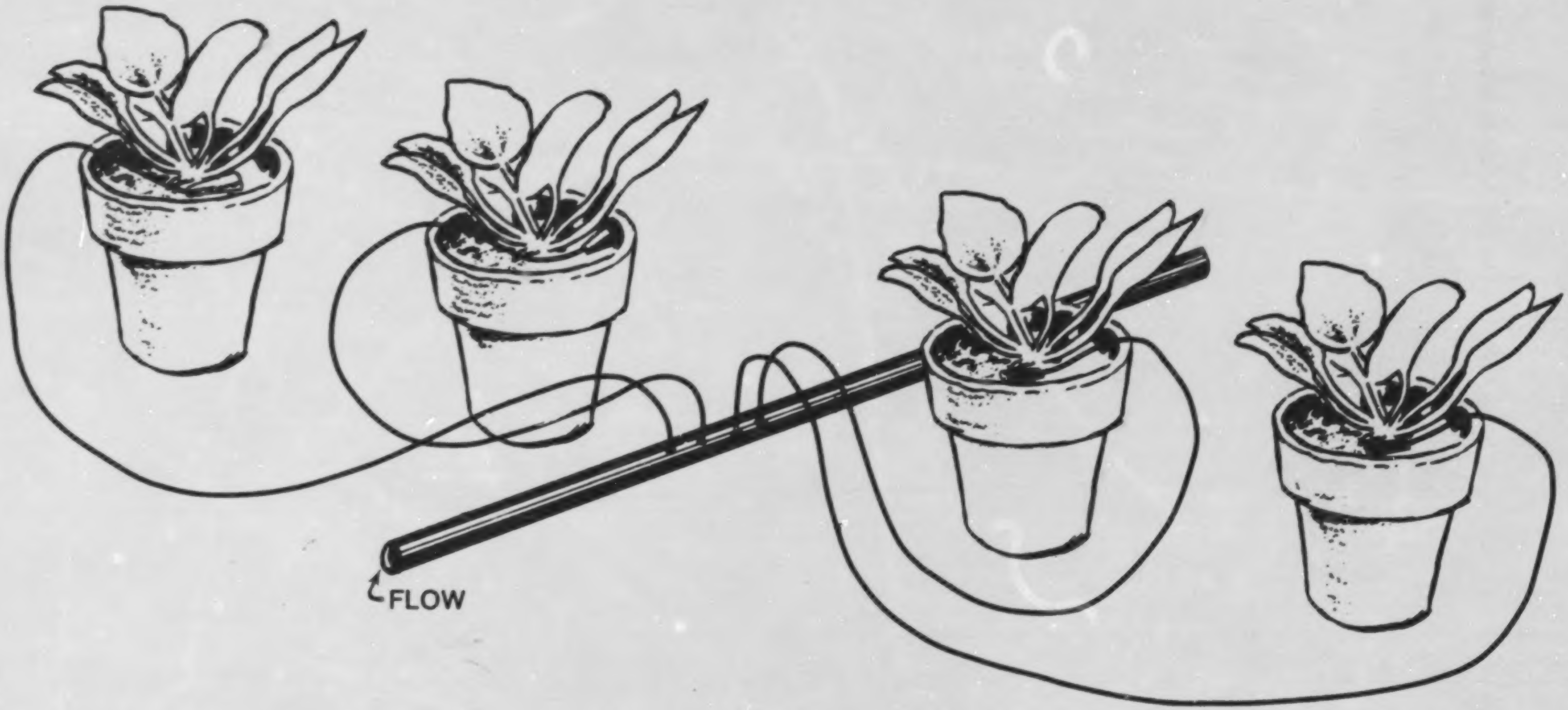


Constriction in the tube of maximum thermometer

MISTING SYSTEM



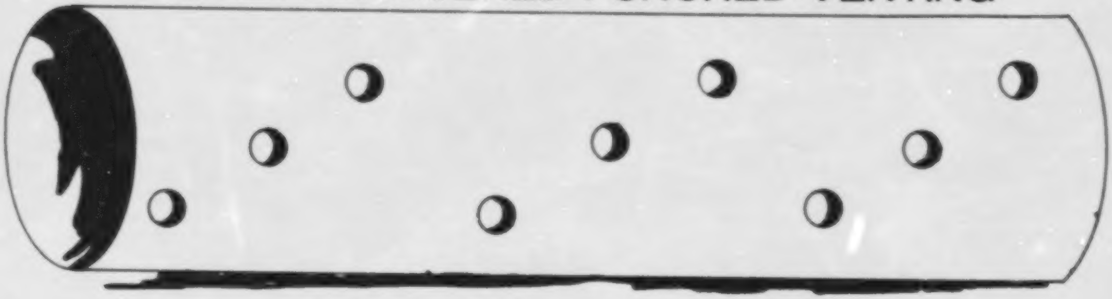
TRICKLE WATERING SYSTEMS



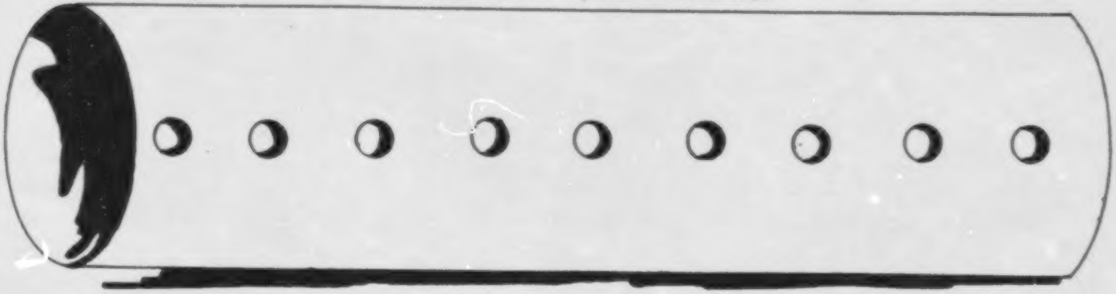
→ MAIN→LEADER TUBES→POTS →

POLYETHYLENE CONVECTION TUBES

MULTIPLE STAGGERED PUNCHED VENTING



SINGLE-LINE PUNCHED VENTING



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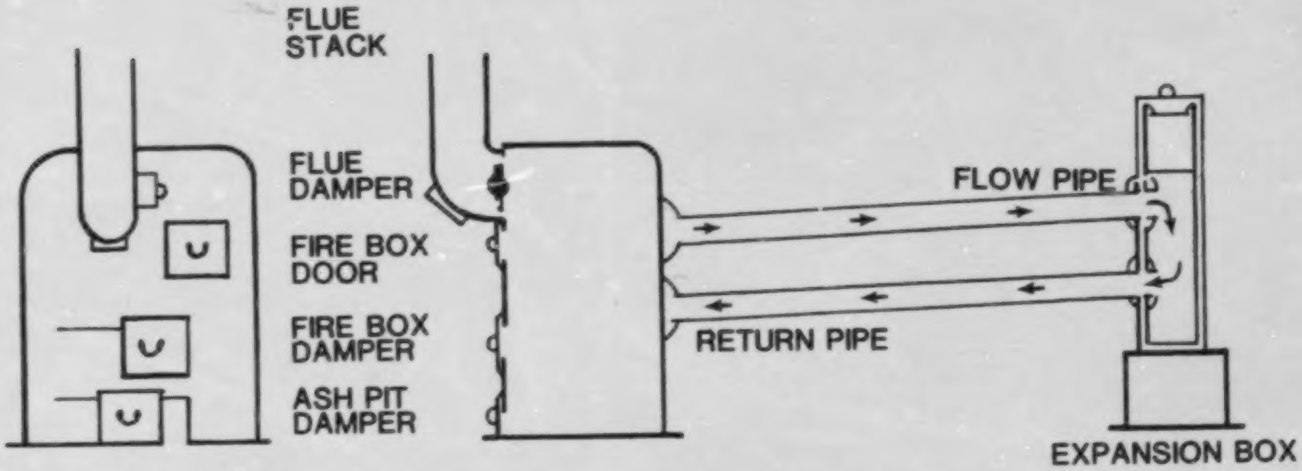
BOILER/HOT WATER HEATING SYSTEM


FLUE STACK
FLUE DAMPER
FIRE BOX DOOR
FIRE BOX DAMPER
ASH PIT DAMPER
FLOW PIPE
RETURN PIPE
EXPANSION BOX

SOLID FUEL BOILER

HOT WATER SYSTEM

TRANSPARENCY DISCUSSION GUIDE

REPAIRING GREENHOUSE OR HORTICULTURAL EQUIPMENT

I. Transparency -CONTROL SYSTEMS: THERMOSTATS AND TIMERS

A. Thermostats and timers are important devices used to regulate systems that control the environment in the greenhouse. Thermostats control heating, cooling and ventilation systems, and time clocks control watering, misting, lighting and shading.

B. The standard on-off timer has a 24 hour dial and as many as 12 on-off operations per day. Other models may have specific operating cycles. For example,

Repeating Cycle	Actuating time of each tripper
5 min.	2½ sec.
10 min.	5 sec.
30 min.	15 sec.
1 hr.	30 sec.
2 hrs.	1 min.
4 hrs.	2 min.

II. Transparency -MINIMUM-MAXIMUM THERMOMETER

A. Minimum-maximum thermometers are used extensively in greenhouses to assist in the setting of heating and cooling systems. This thermometer will record both the highest and lowest temperature reached for any time period until it is reset.

III. Transparency -MIST-A-MATIC CONTROL SYSTEM

A. The mist-a-matic misting system uses a mesh screen to activate the misting nozzles. As the screen becomes saturated with water, the weight of the water forces the screen downward and activates a cut-off switch. No timing device is used with this system.

IV. Transparency -CHAPIN POT WATERING SYSTEM

A. The Chapin pot watering system is one of the most popular systems found in greenhouses. This system waters each pot individually and is very efficient for hanging baskets.

V. Transparency -POLYETHYLENE CONVECTION TUBES

A. Polyethylene convection tubes are used to ventilate greenhouses. A fan draws the air through the tubes which run the length of the greenhouse. The fan is regulated by a thermostat.

VI. Transparency -BOILER/HOT WATER HEATING SYSTEM

A. The hot water boiler is the most common form of heating system. Boilers vary in size and output of heat. Manufacturers can recommend the correct size boiler for any greenhouse.

SAMPLE TEST QUESTIONS AND TEACHERS KEY

REPAIRING GREENHOUSE OR HORTICULTURAL EQUIPMENT

TRUE OR FALSE:

_T_ 1. A maximum-minimum thermometer reads the highest and lowest temperature for a given period.

_F_ 2. A maximum-minimum thermometer can be placed anywhere in the greenhouse.

_F_ 3. Thermostats help control misting systems.

_F_ 4. Time clocks may be set once a year to regulate lights.

_T_ 5. The temperature in the return pipes of a hot water system are usually cooler than the temperature of the flow pipes.

_T_ 6. Poor ventilation can cause disease and slow plant growth.

_T_ 7. The Chapin pot watering system waters each container individually.

_T_ 8. A mist-a matic mist system does not use a time clock to regulate itself.

SHORT ANSWER:

9. Name 2 greenhouse systems that are regulated by a thermostat.

   -- heating system
   -- cooling system

10. Name 3 greenhouse systems that can be controlled by a time clock.

   -- mist system
   -- lighting
   -- shading
   -- watering

11. Describe a common malfunction of a misting system.

   --mineral deposit buildup

12. Why is a ventilation system used in a greenhouse?

   -- provides fresh air, CO_2
   -- inhibits disease
   -- aids temperature regulation

13. When should your heating system be checked?

-- before the heating season begins

14. Name 4 items you would check regularly in a greenhouse to make sure everything is working properly.

-- check misting heads to see if they are clogged
-- monitor watering system
-- check glass (or plastic) for damage
-- check steel parts for rust
-- inspect accuracy of time clocks
-- inspect wiring for cracks in insulation
-- service heating system in early fall

15. Describe the Chapin pot watering system.

A main water line runs through the greenhouse that has several small tubes connected to it. Each tube will be placed in an individual pot to water it. They should be checked regularly to make sure they are not clogged.

FILL IN THE BLANKS

16. Growing temperature - coldest outdoor temperature = temperature difference

17. Temperature difference x total glass area (sq ft) = total unadjusted BTU's

18. Total unadjusted BTU's x glass thickness = necessary BTU output

19. Mr. Greenhouse wishes to grow a crop at 55°F. He lives in central Illinois where the coldest possible temperature may reach -25°. He has a greenhouse with 1000 sq ft of glass at a double layer. What is his necessary BTU output?

55° - -25° = 80°
80° x 1,000 sq ft = 80,000 unadjusted total BTU's
80,000 x .8 = 64,000 necessary BTU output

UNIT E: PLANT PROPAGATION

PROBLEM AREA: PROPAGATING SOFTWOOD CUTTINGS

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with third year or advanced students in a horticultural occupations program. The recommended time for teaching this problem area is during the late spring.

The estimated instructional time for this problem area is 3 to 5 days, depending on how far the teacher wishes to develop propagating skills. If the teaching plan is limited to classroom discussion with little or no practice or observation, the instructional time can be 2 days or less. If the students are to be involved in other activity exercises, the instructional time will need to be increased.

The instructor is encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt this problem area to their local situation.

CREDIT SOURCES:

These materials were developed through a funding agreement, R-33-13-D-0362-466 with the Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Research and Development Section, 100 North First Street, Springfield, Illinois 62777. Opinions expressed in these materials do not reflect, nor should they be construed as policy or opinion of the State Board of Education or its staff.

The teacher's guide, information sheet, laboratory exercise, and sample test questions were developed by Ron Biondo, District 214 High School. Suggestions and guidance in the development of these materials were provided by the Metropolitan Core Curriculum Field Test Teachers.

TEACHER'S GUIDE

I. Unit: Plant propagation

II. Problem area: Propagating softwood cuttings

III. Objectives: At the close of this problem area, students will be able to:

1. Properly select and remove softwood cuttings from stock plants.
2. Provide softwood cuttings with the optimum environment for rooting.

IV. Suggested interest approaches:

1. Bring softwood cuttings from the greenhouse that were propagated the previous year to class. Display their progress.
2. Bring softwood cuttings to class and poll the students as to whether or not they think the cuttings will root.

V. Anticipated problems and concerns of students:

1. What is a softwood cutting?
2. What plants can be propagated by softwood cuttings?
3. Do softwood cuttings root easier than other types of cuttings?
4. What is the ideal temperature for rooting softwood cuttings?
5. How long does it take for roots to form on softwood cuttings?
6. Should rooting hormones be used with softwood cuttings?
7. How long should a softwood cutting be?
8. Should any leaves be removed from the cutting?
9. When is the best time to collect cuttings?
10. How should cuttings be stored until "sticking"?
11. Should cuttings be placed in the sun or shade?
12. How do mist systems aid rooting?
13. How do I recognize good softwood material?
14. What is callus?
15. What is a propagation cloche?

VI. Suggested learning activities and experiences:

1. Demonstrate how to propagate plants by softwood cuttings.
2. Visit a nursery and observe how the professional propagator starts nursery plants with softwood cuttings.
3. Have the students read Information Sheet 1 - Softwood (Greenwood) Cuttings.
4. Discuss the ideal rooting conditions for softwood cuttings.
5. Have the students ready the propagation media, the mist system, shade cloth, etc., for softwood cuttings.
6. Have the students take and stick softwood cuttings as described in Information Sheet 1 - Softwood (Greenwood) Cuttings. Use Laboratory Exercise 1 - Softwood Cuttings.
7. Have the students maintain a record of the progress of the cuttings.
8. Pot the cuttings once they have rooted. Allow the students to take some rooted cuttings home.
9. Encourage students to have an S.O.E.P. involving softwood cuttings.

VII. Application procedures:

1. Information presented in this problem area will help students become familiar with the propagation of woody ornamental plants.
2. Students interested in nursery work should find the information presented in this problem area helpful.

VIII. Evaluation:

1. Evaluate and grade laboratory exercise performed by students.
2. Administer a written exam using the sample test questions included in this problem area.

IX. References and aids:

1. 50 Laboratory Exercises for Vocational Ornamental Horticulture, Paul Hemp, The Interstate Printers and Publishers, Danville, IL, pp. 61-62.
2. University of Illinois Vocational Agriculture Service Subject Matter Unit 5006a - Producing Plants by Asexual Propagation.
3. Plant Propagation, Principles and Practices, Third Edition, Hudson T. Hartmann and Dale E. Kester, Prentice-Hall Inc., Englewood Cliffs, New Jersey, p. 271.

4. Introductory Horticulture and Introductory Horticulture Instructor's Guide, Second Edition, H. Edward Reiley and Carroll L. Shry, Jr., Delmar Publishers, Albany, New York (1983), pp. 108-123.

INFORMATION SHEET 1

SOFTWOOD (GREENWOOD) CUTTINGS

Cuttings taken from soft, succulent, new spring growth of deciduous or evergreen plants are called softwood cuttings. Softwood cuttings can be started from many ornamental woody shrubs and trees including maple, magnolia, forsythia, lilac, spirea and weigela.

When selecting cuttings it is important to use shoots which are neither extremely fast-growing and tender or old and woody. The extremely fast-growing shoots quite often will deteriorate before rooting, while the old woody stems may not root at all. The best material to use for cuttings should display some flexibility, but will snap when bent. Average shoots located in full sun are most desirable.

It is best to collect cuttings early in the day. Once taken the cuttings should be kept moist and cool. Cuttings exposed to the sun for a few minutes or soaked in water for prolonged periods may be severely damaged.

In preparing the cuttings for propagation cut each to a length of 3-5 inches. The basal cut should be just below a node. Leaves on the lower portion of the cutting should be removed while those on the top retained. All lower buds should be removed.

Softwood cuttings will root more quickly than other types of cuttings. Rooting speed can be increased with the application of rooting hormones. Propagating media should be kept at 75° to 80°F and the air temperature should be approximately 70°F. Maintaining high humidity around the plants is extremely important and should be a major concern. Softwood cuttings should not be kept in direct sunlight. With optimum environmental conditions, softwood cuttings will begin to root within two to five weeks.

LABORATORY EXERCISE 1

SOFTWOOD CUTTINGS

PURPOSE: To propagate woody ornamental plants by softwood cuttings.

MATERIALS NEEDED:

1. Pruner
2. Chlorine bleach
3. Rooting hormone powder
4. Plastic garbage bag
5. Maple, magnolia, forsythia, lilac, weigela, or juniper
6. Rooting media (peat moss and perlite)
7. Labels

PROCEDURE:

1. Sterilize the pruner cutting blade with chlorine bleach.
2. Take cuttings about 3-5 inches long. The basal cut should be made just below a node. Store the cuttings in a plastic garbage bag from the field to the greenhouse.
3. Remove the lower leaves from the cutting, leaving the petioles on the stem.
4. Score (vertical cuts about 1 inch long through the cambium) the basal end of each stem.
5. Dust the basal end of the stem with rooting hormone powder. Tap any excess rooting hormone from the stem.
6. Stick the cuttings at least one but no more than two inches into the rooting medium.
7. A mist system set up over the cuttings is ideal for maintaining high humidity. Otherwise, cover with a clear plastic tent.
8. Label the cuttings, indicating what they are and the date they were taken.

LABORATORY EXERCISE 1 - continued

OBSERVATIONS:

DISCUSSION QUESTIONS:

1. Why are cuttings taken just below a node?

2. Which shoots are best for hardwood cuttings?

3. Why are the lower leaves removed?

4. How does rooting hormone powder aid rooting?

SAMPLE TEST QUESTIONS AND TEACHER'S KEY

PROPAGATING SOFTWOOD CUTTINGS

MULTIPLE CHOICE:

C 1. Softwood cuttings are taken from ________.

- a. older woodier stems.
- b. extremely fast growing shoots.
- c. succulent new spring growth.
- d. shoots growing in the shade.

B 2. The best time to collect cuttings is ________.

- a. around dusk.
- b. early in the day.
- c. around noon when the sun is bright.
- d. anytime.

A 3. Fresh cuttings should be placed ________.

- a. in a cool, moist location.
- b. in the sun to harden off.
- c. in water for about 24 hours so they don't dry out.
- d. in a freezer to slow metabolism.

C 4. Softwood cuttings should be cut to a length of about ________ inches.

- a. 6-9.
- b. 2-3.
- c. 3-5.
- d. 12.

D 5. The basal cut should be made ________.

- a. just above a node.
- b. right through a node.
- c. on the stem exactly between two nodes.
- d. just below a node.

A 6. Leaves should be ________.

- a. removed from the lower portion of the cutting.
- b. removed from the upper portion of the cutting.
- c. removed from the entire shoot.
- d. left on the entire shoot.

C 7. Softwood cuttings root ____________.

a. more slowly than other cuttings.
b. at about the same rate as other cuttings.
c. more quickly than other cuttings.
d. if you're lucky.

A 8. Rooting hormones ____________.

a. speed rooting.
b. are expensive, therefore impractical.
c. do little for a cutting.
d. both (a) and (b).

C 9. Temperature of the propagating media should be kept at a constant ____________.

a. 50°F.
b. 65° - 70°F.
c. 75° - 80°F.
d. 85° - 90°F.

B 10. Softwood cuttings generally show root growth within ____________.

a. 2 to 5 days.
b. 2 to 5 weeks.
c. 2 to 5 months.
d. 2 to 5 years.

SHORT ANSWER:

1. Describe in detail the procedures that should be followed for a successful softwood cutting.

   (See Laboratory Exercise 1 - Softwood Cuttings and Introductory Horticulture Instructor's Guide page 12.)

UNIT E: PLANT PROPAGATION

PROBLEM AREA: PROPAGATNG WOODY PLANTS BY BUDDING AND GRAFTING

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with advanced students in a horticultural or agricultural occupations program. The recommended time for teaching this problem area is during the fall or spring.

The estimated instructional time for this problem area is 3-5 days, depending on how far the teacher wishes to develop grafting skills at the third year level. If the teaching plan is limited to classroom discussion with little or no practice or observation, the instructional time can be 3 days or less. If the students are to be involved in other activity exercises, the instructional time will need to be increased.

The instructor is encouraged to conduct a local search to locate other supplementary materials for use with this problem area. Nurseries and garden centers can supply some of the grafting materials necessary for laboratory activities. Additional supplies can be located in the American Nurserymans Magazine, 310 South Michigan Avenue, Suite 302, Chicago, Illinois 60604 (Phone number: 312-922-9011) and A. H. Hummeer Seed Company, 2746 Chouteau Avenue, St. Louis, MIssouri 63103 (Phone number: 800-325-3055). The items in this problem area are for reference or modification as instructors adapt this problem area to their local situation.

CREDIT SOURCES:

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The teacher's guide, competency inventory, laboratory exercises, and sample test questions were developed by Jim Ethridge, Joliet Jr. College and Kallie Grobstein, Department of Vocational and Technical Education, University of Illinois. Transparency masters were prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Metropolitan Core Curriculum Field Test Teachers, and Dr. Martin M. Meyer, Jr., Department of Horticulture, University of Illinois.

TEACHER'S GUIDE

I. Unit: Plant propagation

II. Problem area: Propagating woody plants by budding and grafting

III. Objectives: At the close of this problem area, students will be able to:

1. Identify reasons why plants are propagated by budding and grafting
2. Identify various methods used to bud and graft plants (the different types of grafts)
3. Perform basic budding and grafting methods

IV. Suggested interest approaches:

1. Review basic grafting and safety procedures from Metropolitan Core Curriculum II. Show samples of the results from last year.
2. Ask the students if they think it is possible to grow a blooming plant (ex: hybiscus) with more than one color flower on the same plant.
3. Graft a yellow twig dogwood as well as a variegated deciduous dogwood to get a multiple color foliage and stem plant.
4. Show slides of different types of grafted fruit trees. Discuss why this is commercially profitable.
5. Visit a local nursery and observe newly grafted plants. Compare them with more established grafted plants.
6. Take a field trip in the neighborhood and point out examples of plants grafted for ornamental purposes (ex: look for weeping cherry trees).

V. Anticipated problems and concerns:

1. What is the difference between budding and grafting?
2. Why are plants grafted?
3. Why are fruit trees grafted?
4. What are the different types of grafts used on woody plants?
5. How will the characteristics of the stock influence the scion?
6. What types of budding exist?
7. What plants are commonly budded?

8. How can I determine if 2 plants are compatible?

9. How does one insert a bud?

10. What is a leaf bud shield?

11. What are the steps to insure proper budding?

12. Are sanitary procedures used on grafting woody plants?

13. Is matching cambium important in grafting woody plant materials?

14. How long does it take for a woody graft to callus?

15. When is the proper time to bud or graft in Illinois?

VI. Suggested learning activities and experiences:

1. Display several different plants that have been successfully grafted. Ask students to list the reasons why plants are propagated by budding and grafting.

2. Use the following transparencies enclosed in this problem area to create discussion on the advantages of budding and grafting woody plants.

   A. Grafting Changes a Plant
   B. A Reason for Grafting
   C. Natural Grafts

3. Have the students look for a natural graft on the school property or at home.

4. Have students make a display of each grafting and budding technique. The display should identify those plants which can be used for budding and grafting. This can be used as a FFA poster contest by awarding prizes to students with the best educational display.

5. Demonstrate grafting to science classes to increase student's awareness of the horticulture program.

6. Use the transparency, Cross Section of a Graft Union, enclosed in this problem area to show how the stock and scion join together.

7. Demonstrate the side grafting of a woody plant. Use the transparencies on side grafting enclosed in this problem area to show specific details.

8. Have students complete Laboratory Exercise 1 - A Side Graft.

9. Demonstrate the T-Budding of a woody plant. Use the transparencies on T-Budding enclosed in this problem area to show specific details.

10. Have students complete Laboratory Exercise 2-T-Budding.

11. Bud salmon and yellow, hybiscus buds on a red blossom hybiscus stock, or various types of rose buds on rose stock.

12. Have students practice collecting bud wood stock.

13. Demonstrate the whip and tongue grafting of a woody plant. Use the transparencies on whip and tongue grafting enclosed in this problem area to show specific details.

14. Collect scion wood from taxus cuspidata (Yew) and practice whip and tongue graft.

15. Have students complete Laboratory Exercise 3-Whip and Tongue Grafting of Redtwig and Yellowtwig Dogwoods.

16. Use the competency sheet to discuss entry level requirements for work involving propagating woody plants. Have students complete the competency sheet at the end of the unit, so they can assess their progress.

17. Have students utilize grafting skills as a possible science fair project.

18. A sharp knife is extremely important in grafting. It is impossible to get the smooth, even cut needed when using a dull knife. Refer to Metropolitan Core Curriculum II, Unit E, page M-11-E-1-8, and Plant Propagation, Principles and Practices by Hartman and Kester, pages 402 and 403 for knife sharpening skills.

19. Make up a safety awareness test and administer to students before they begin grafting laboratory exercises. Students should be required to pass the safety test in order to work in the laboratory.

20. Have students bud various varieties of roses on rosa multiflora and rosa vugosa root stock. Refer to Time Life Encyclopedia of Gardening, "Roses," page 92 for a step-by-step illustration of this process. In addition, Garden Roses, a horticultural fact sheet published by the Illinois Cooperative Extension Service, lists 28 reference books and 37 mail order firms dealing with roses.

VII. Application procedures:

1. Students will be aware of the advantages of budding and grafting woody plants.

2. Students will be able to apply skills learned in the laboratory or school greenhouse to on-the-job experience and their S.O.E.P. Budding and grafting activities can also be done at home with minimum expense.

3. Students should be able to bud and graft plants successfully rather than just simply observe or explain the procedures.

VIII. Evaluation:

1. Evaluate and grade laboratory exercises performed by students.

2. Administer a written exam using the sample test questions enclosed in this problem area.

3. Check student progress through use of the competency sheet.

IX. References and aids:

1. Plant Propagation, Principles and Practices, Third Edition, Hudson T. Hartman, and Dale E. Kester, Prentice-Hall, Inc., Englewood Cliffs, New Jersey

2. Competency Inventory

3. Selected laboratory exercises

4. Selected transparencies

5. Metropolitan Core Curriculum II, Unit E

6. The Time-Life Encyclopedia of Gardening-Roses and The Time-Life Encyclopedia of Gardening-Pruning and Grafting, Time-Life Books, Alexandria, Virginia. These books are available at most local libraries and retail garden centers.

7. Introductory Horticulture, H. Edward Reiley and Carroll L. Shry, Jr., Delmar Publishers, Albany, New York (1979)

8. Laboratory Manual in Horticulture, E. L. Denisen, and H. E. Nichols, Iowa State University Press. Ames, Iowa (1962)

9. Nursery Production Teacher's Manual, 1971, Instructional Materials Services, Department of Agriculture and Extension Education, Pennsylvania State University, University Park, PA. 16802

10. The Nursery Worker Part I and II, Ohio Agricultural Education Curriculum Materials Service, Room 254, Agricultural Administration Building, 2120 Fyffe Road, The Ohio State University, Columbus, Ohio 43210

11. Nursery Crops and Landscape Designs for Agribusiness Studies, George S. Williams, The Interstate Printers and Publishers, Inc., Danville, Illinois 61832.

12. 50 Vocational Laboratory Exercises for Vocational Ornamental Horticulture Students, Paul E. Hemp, The Interstate Printers and Publishers, Inc., Danville, Illinois 61832.

COMPETENCY INVENTORY

PROPAGATING WOODY PLANTS BY BUDDING AND GRAFTING

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

	Competency	Circle One						
1.	Select and collect plant materials for reproduction	1	2	3	4	5		
2.	Label rows or areas	1	2	3	4	5		
3.	Select and use tools, equipment and other materials used in budding and grafting	1	2	3	4	5		
4.	Make a side graft	1	2	3	4	5		
5.	Make a whip and tongue graft	1	2	3	4	5		
6.	Propagate plants by T-budding	1	2	3	4	5		
7.	Identify methods used to bud and graft plants	1	2	3	4	5		
8.								
9.								
10.								
11.								
12.	Identify reasons why plants are propagated by budding and grafting						6	7
13.	Plan propagation schedules						6	7
14.	Prepare planting media						6	7
15.	Control plant environment						6	7

These competencies outlined in the National Ag Occupations Competency Study are for entry level positions in horticulture.

Name Date

LABORATORY EXERCISE 1

A SIDE GRAFT (SPLICED SIDE GRAFT)

INTRODUCTION: This variation of side grafting is widely used especially for grafting small potted plants, such as evergreens.

MATERIALS:

Stock
Scion
Knife
Alcohol
Waxed string, budding rubbers or raffia
Peat moss

PROCEDURE:

1. A shallow downward and inward cut from 1 to 1½ inches long is made in a smooth area on the stock.
2. At the base of this cut, a second short inward and downward cut is made, intersecting the first cut. Remove the piece of wood and bark.
3. Prepare the scion with a long cut along one side and a very short one at the base of the scion on the opposite side.
4. The cuts on the stock and scion should be the same length and width so the cambium layers can be matched as close as possible.
5. Insert the scion and wrap with waxed (paraffin) string, budding rubbers, or raffia.
6. Plunge the graft into a damp medium (peat moss) so it just covers the graft union.
7. The newly grafted plant may be placed in a propagation bench.
8. After the union has healed, the stock can be cut back above the scion.

OBSERVATIONS:

LABORATORY EXERCISE 2

T-BUDDING (SHIELD BUDDING)

INTRODUCTION: T-Budding is the most common method of budding and is widely used in propagating nursery stock of most fruit tree species, roses, ash and ginkgo. Budding is limited to stocks appoximately ¼ to 1 inch in diameter with thin bark.

Note: The amount of tension given the budding rubber is very important. Tie from the top down to prevent the bud from popping out.

MATERIALS:

Stock
Budding material
Knife
Alcohol
Waxed string, budding rubbers or raffia

PROCEDURE:

1. A vertical cut about 1 inch long is made in the stock.
2. A horizontal cut is made through the bark about one-third the distance around the stock. The knife is gven a slight twist to open the two flaps of bark.
3. To prepare the bud, start the cut ½" below the bud; a slicing cut is made under and about 1" beyond the bud.
4. About 3/4" above the bud a horizontal cut is made through the bark and into the wood. The bud is removed.
5. Place the bud on the side of the stock that has the greatest protection from the environment.
6. Buds are inserted into the stock 2 to 10 inches above the soil level.
7. Insert the bud by pushing it downward under the two flaps of bark until the horizontal cuts on the stock and scion are even.
8. Wrap the bud union with budding rubbers, waxed string, or raffia.

OBSERVATIONS:

LABORATORY EXERCISE 3

WHIP AND TONGUE GRAFTING OF REDTWIG AND YELLOWTWIG DOGWOODS

INTRODUCTION: The whip and tongue grafting method allows for a high percentage of cambial contact which heals quickly and results in a strong graft union. To produce a successful graft, the scion and stock should have equal diameters (1/4 to 1/2 inch).

MATERIALS:

Stock	Waxed string, budding rubbers, or raffia
Scion	Plastic bag
Knife	Peat moss
Alcohol	

PROCEDURE:

1. Wrap your hand around the handle of the knife so that it feels comfortable. Hold your thumb parallel with the blade. If you value your thumb, use it as a guide, do not push with it.

2. Hold the scion near your chest and with a slicing motion make a sloping cut from one to two inches long.

3. Make a second cut about 1/2 inch from the end of the twig, parallel with the stem. This cut should be from 1/4 to 1/2 inch deep.

4. Do the same with the stock.

5. Slip the scion and stock together with the tongues interlocking. Both twigs should have two to three buds all facing the same direction.

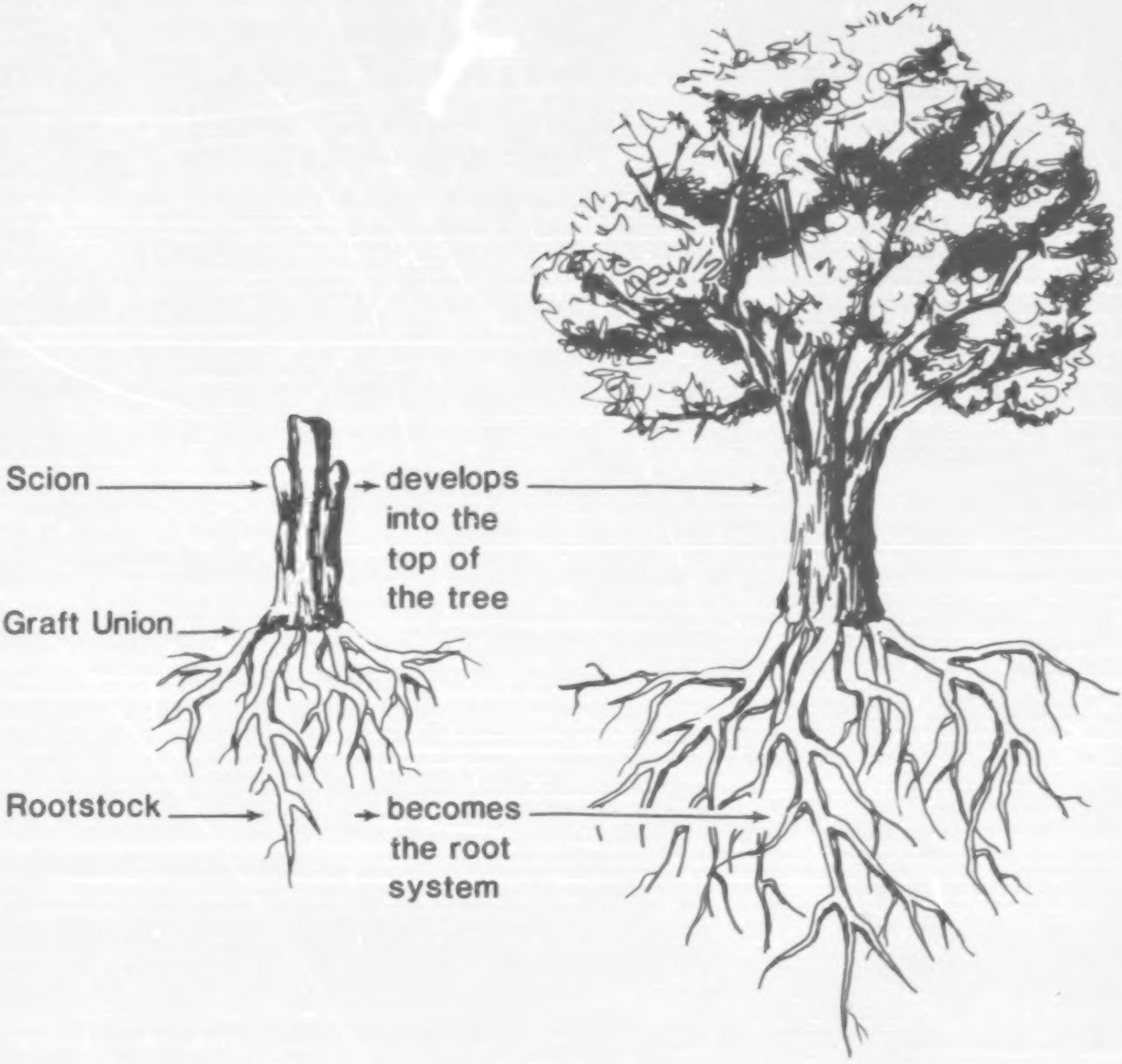
6. If the two twigs are of different size be sure to line up the cambium on one side.

7. Wrap the graft union with waxed string, grafting rubbers, or raffia.

8. Place the product in a plastic bag with moist peat. Put the bag under a bench in the greenhouse for 2-3 weeks in which time callus formation will occur. Remove and root as hardwood cuttings.

OBSERVATIONS:

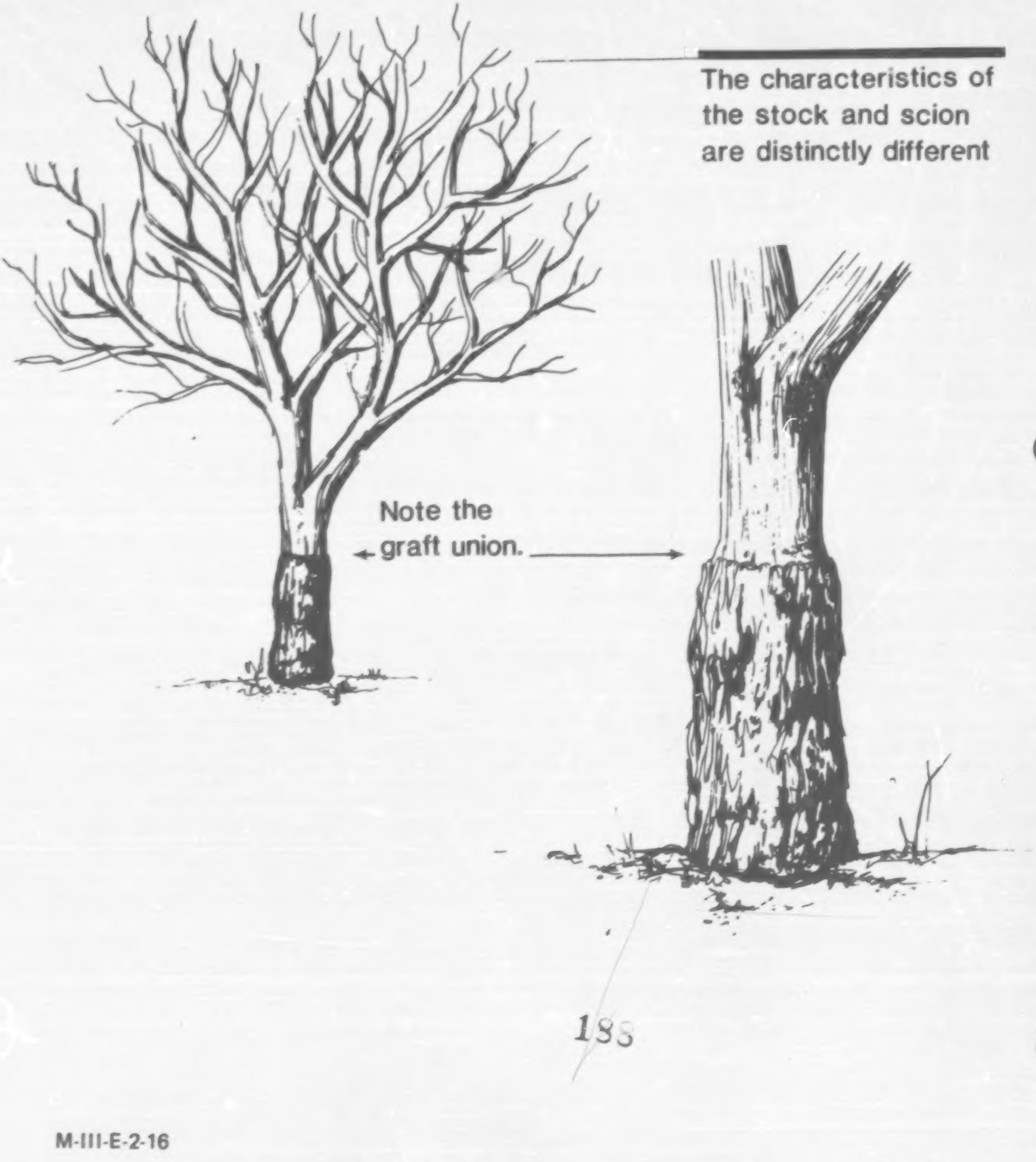
Grafting Changes a Plant


Scion
develops into the top of the tree
Graft Union
Rootstock
becomes the root system

Initial graft

Mature tree

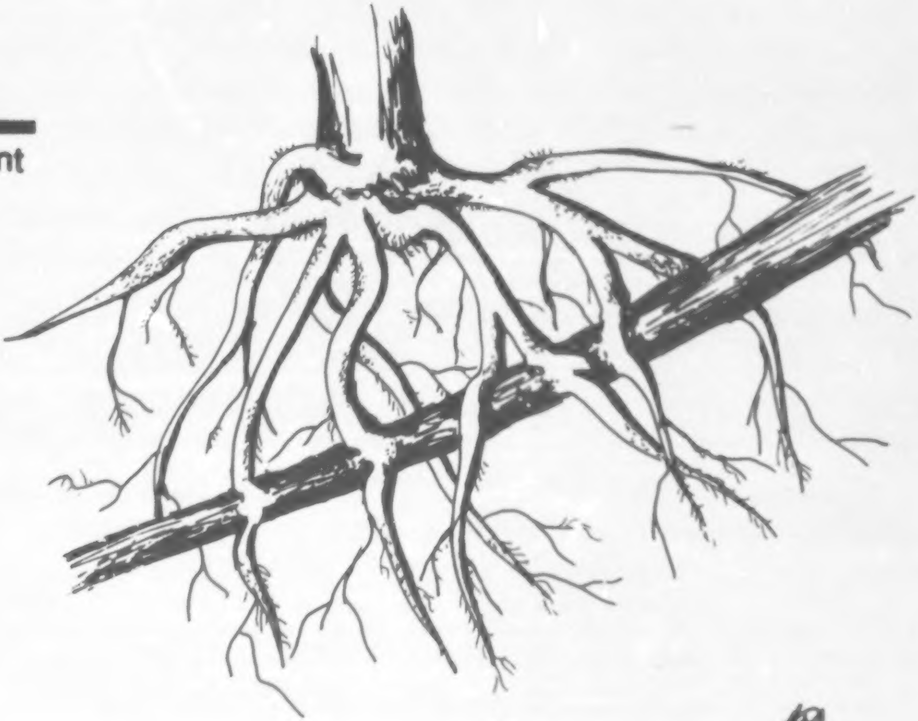
A Reason for Grafting



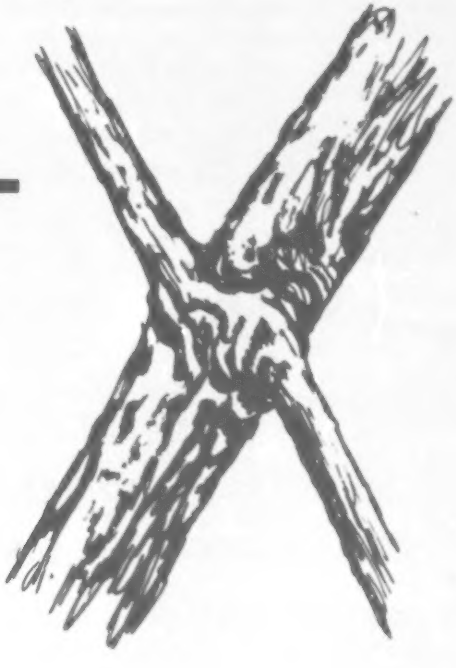
The characteristics of the stock and scion are distinctly different

Note the graft union.

Natural Grafts

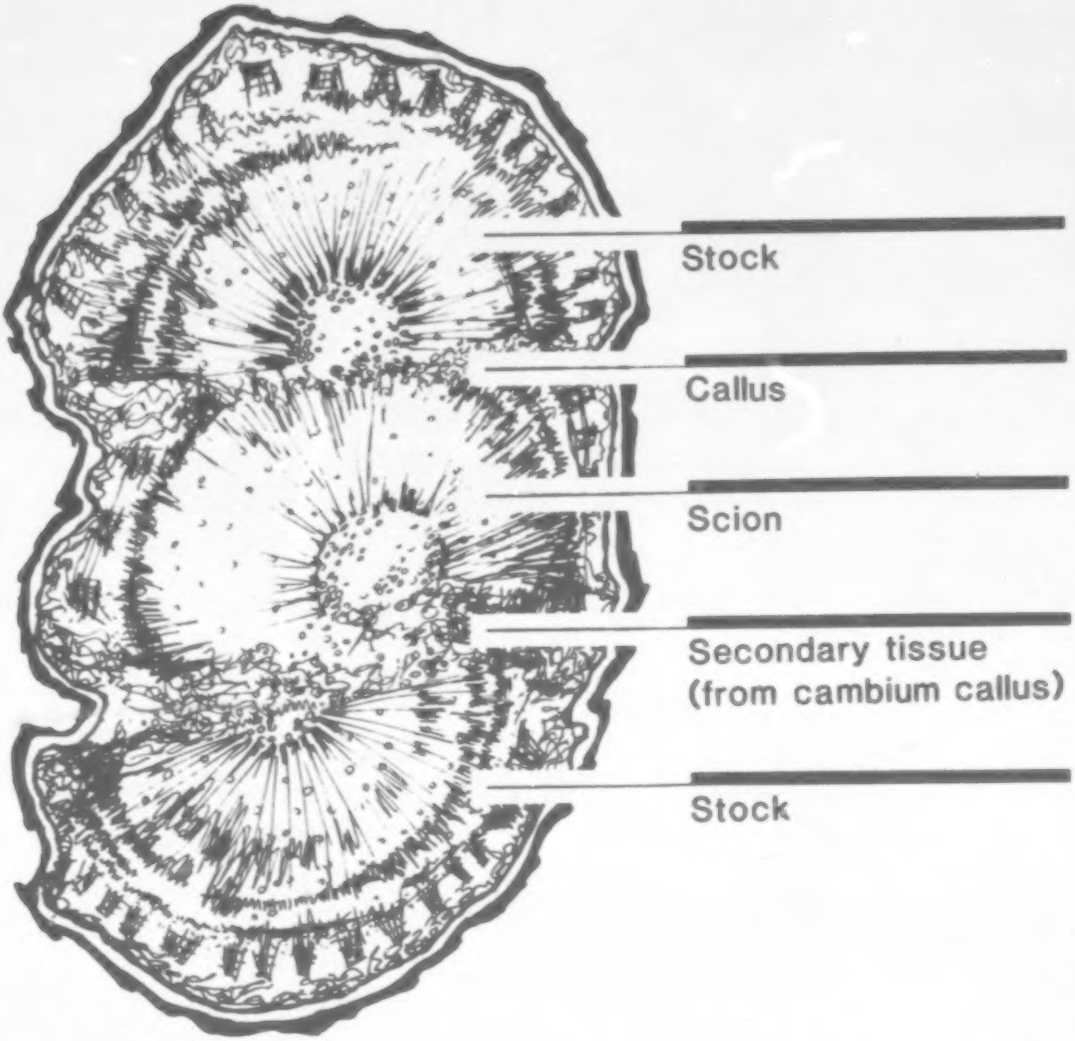


Natural grafts of plant roots.



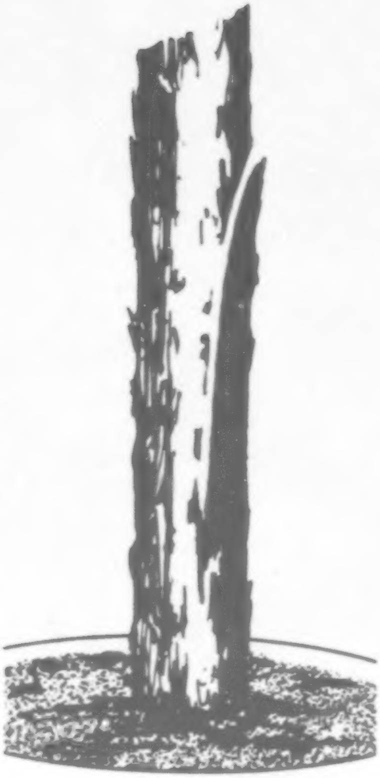
Natural graft of two tree branches.

Cross Section of a Graft Union

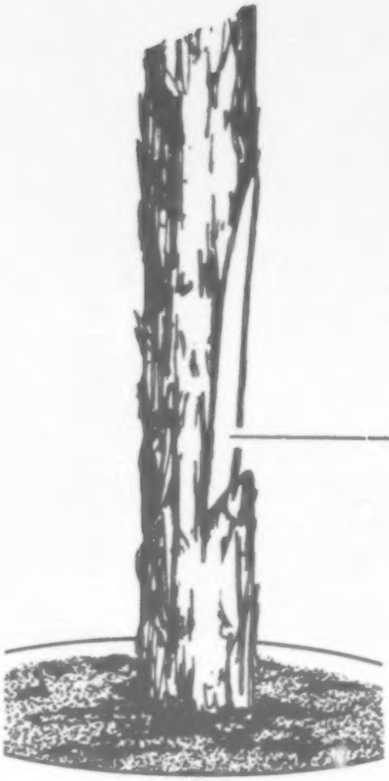

Stock
Callus
Scion
Secondary tissue
(from cambium callus)
Stock

Side Graft –A

Preparing the Stock



A long shallow cut is made into one side of the stem.

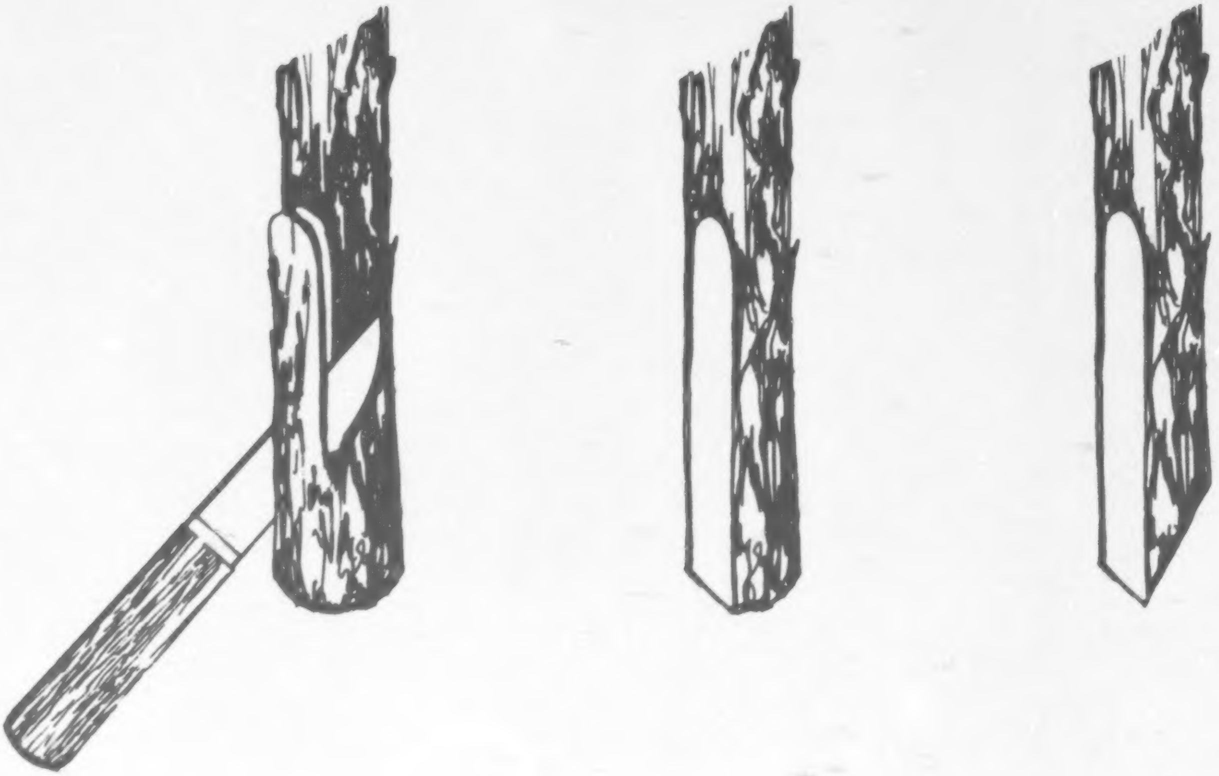


A short, second downward cut is made at the base of the first, removing a piece of the bark and wood.

Discard the removed piece.

Side Graft –B

Preparing the Scion

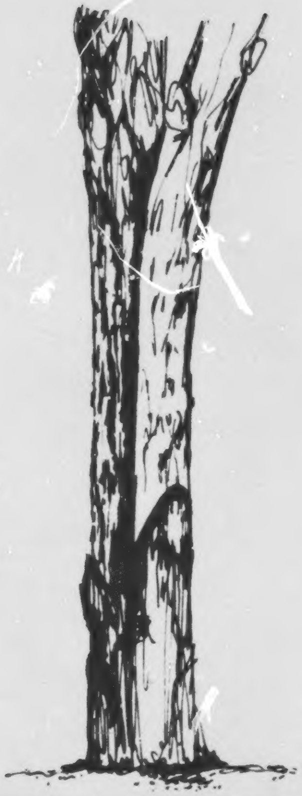


A short, slanting cut is made on the opposite side.

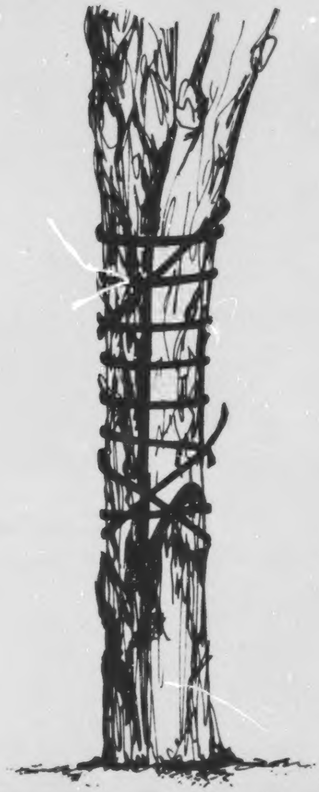
A long, shallow cut is made into one side of the stem.

Side Graft –C

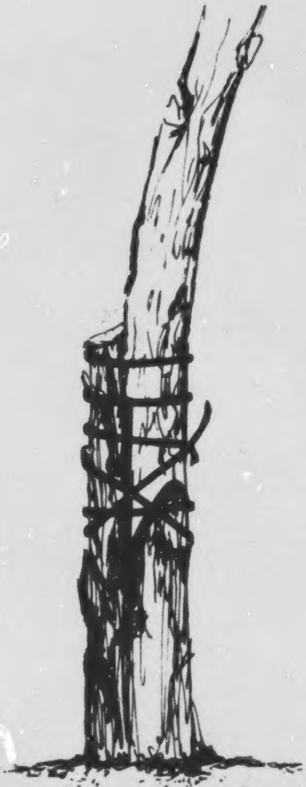
Uniting the Stock and Scion



Place the scion into the stock so that the cambium layers match at least along one side.



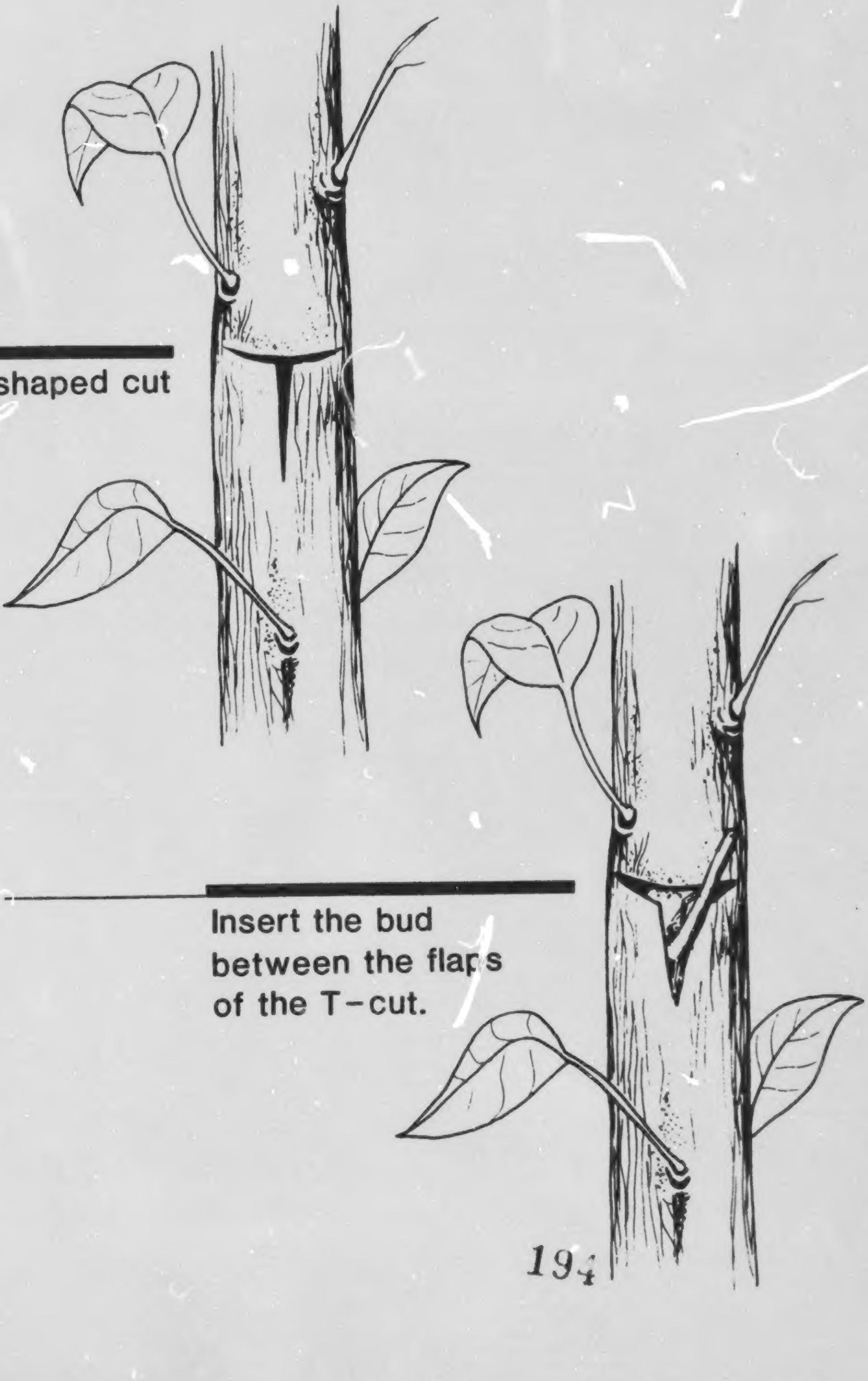
The graft union is tied tightly with a string or rubberband.



The stock is cut back gradually to the scion.

T–Budding –A

Preparing the Stock

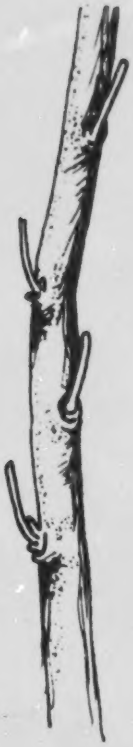


Make a T–shaped cut in the bark.

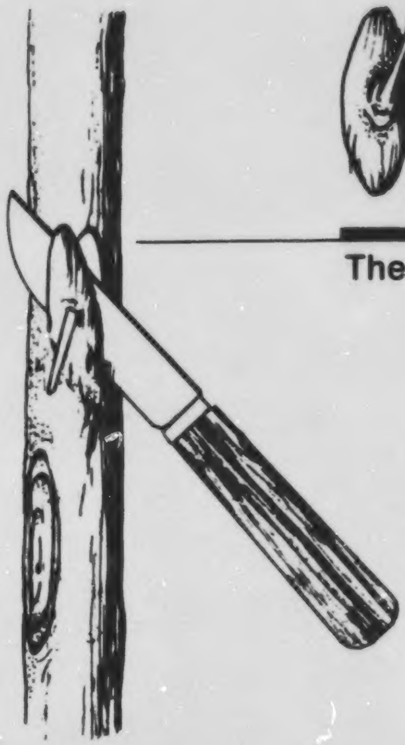
Insert the bud between the flaps of the T–cut.

T–Budding –B

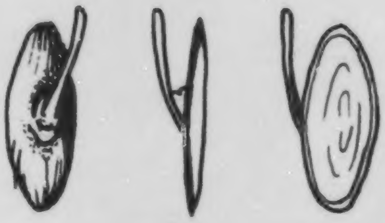
Preparing the Scion



Remove the leaves from the scion wood.

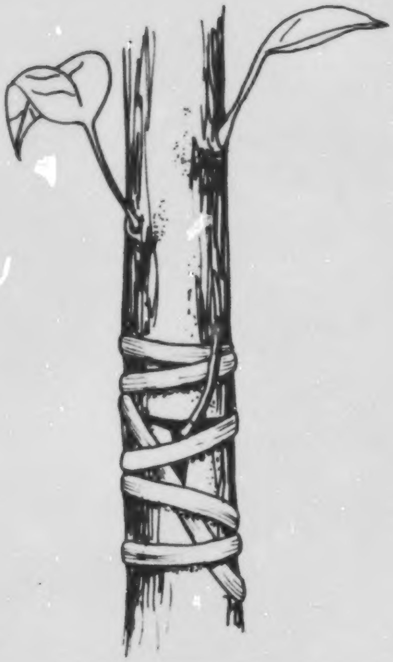


Remove a bud.

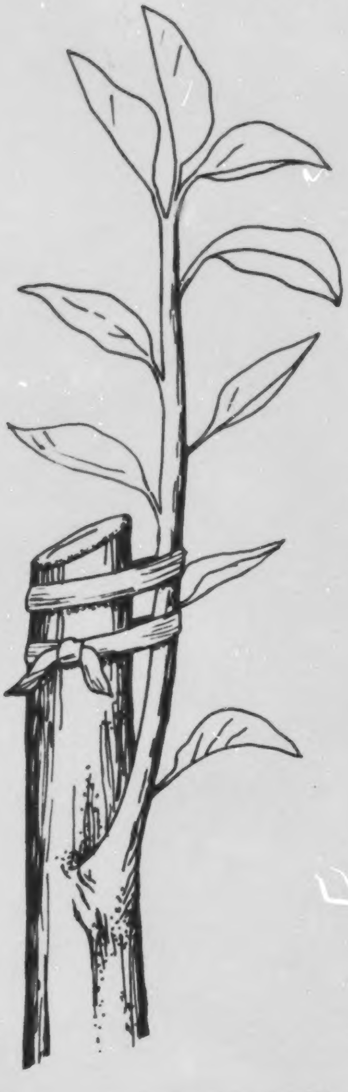


The removed bud.

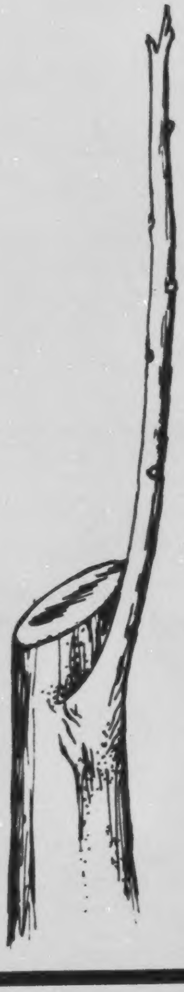
T-Budding -C
Successful Growth of the Bud



Tie the bud under the flaps.



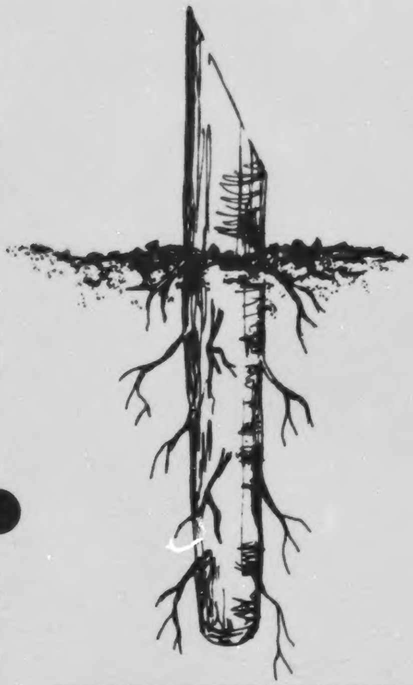
When the bud begins to grow, the stock is cut back.



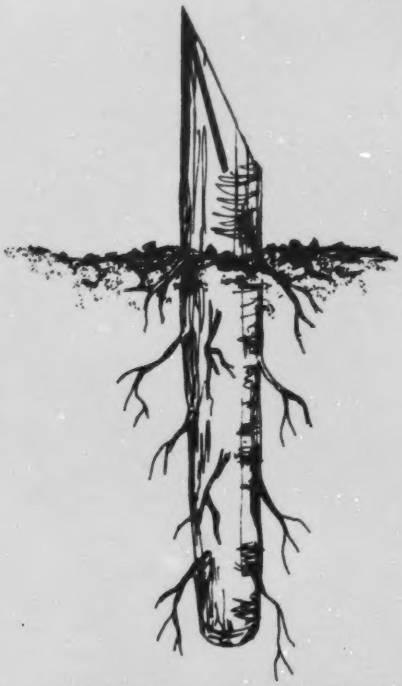
The stock is cut back to the budding point.

Whip and Tongue Graft –A

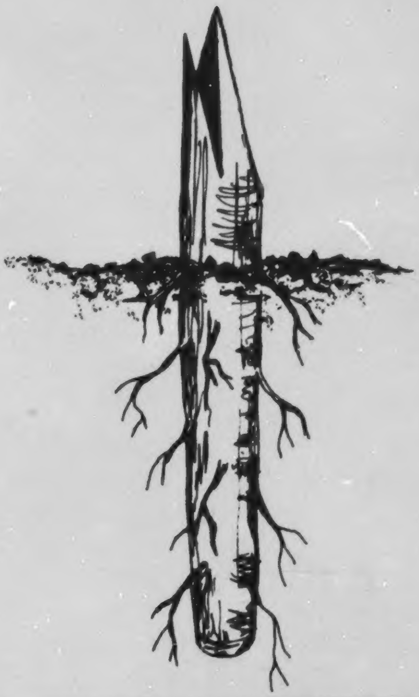
Preparing the Stock



Cut across the stock on an angle.



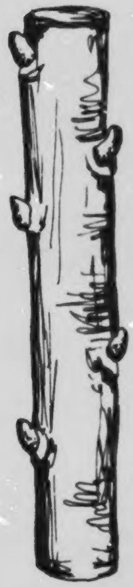
A second cut is made lengthwise.

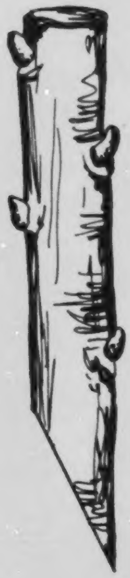


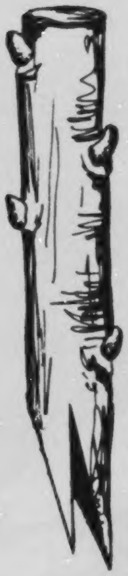
The cut when pulled apart.

Whip and Tongue Graft –B

Preparing the Scion





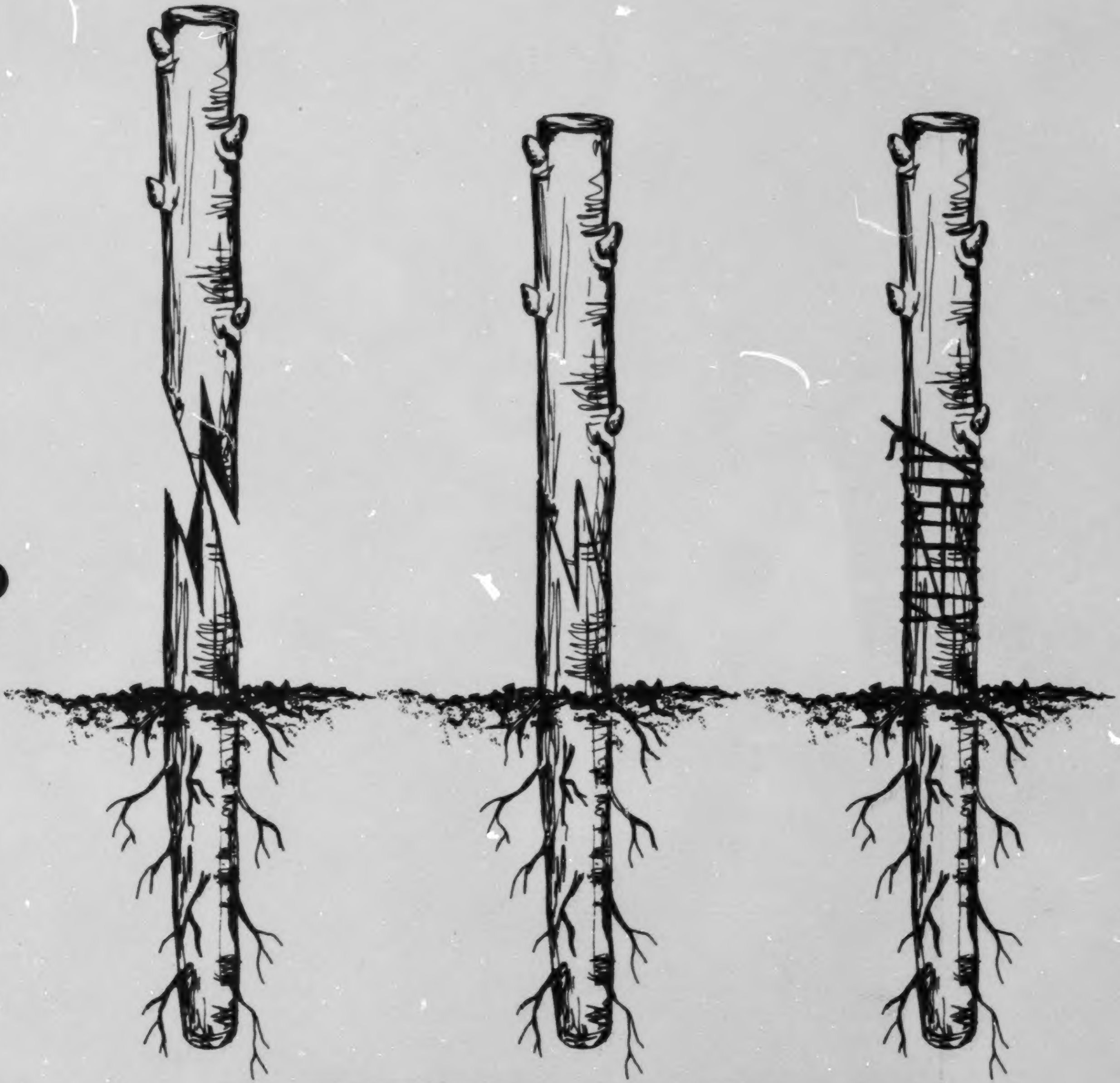


An angle cut is made across the scion.

Next, a lengthwise cut is made on the scion.

Whip and Tongue Graft –C

Uniting Stock and Scion



The tongues of the stock and scion are interlocked.

The graft is tied together.

TRANSPARENCY DISCUSSION GUIDE

PROPAGATING WOODY PLANTS BY BUDDING AND GRAFTING

I. Transparency -- GRAFTING CHANGES A PLANT

A. Use this transparency to discuss how plants can be improved by grafting.

B. Discuss several varieties of fruits that are grafted.

II. Transparency -- A REASON FOR GRAFTING

A. Discuss why trees, roses, and other plants are improved by grafting.

B. Point out the obvious graft union. Explain that it will always remain evident throughout the plant's life.

III. Transparency -- NATURAL GRAFTS

A. Use this transparency to discuss natural grafts found in nature. Ask the students if they can find some in their own gardens.

IV. Transparency -- CROSS SECTION OF A GRAFT UNION

A. Explain how the stock and scion become one by the development of callus tissue.

V. Transparency -- SIDE GRAFT - PREPARING THE STOCK

A. Discuss how this type of graft is used mostly upon ornamentals.

B. The stock is prepared by removing a chip from its side.

VI. Transparency -- SIDE GRAFT - PREPARING THE SCION

A. It is important to match the cambium layers when inserting the scion into the stock

B. Gradually upper portions of the stock are pruned away, leaving only the scion.

VIII. Transparency -- T BUDDING - PREPARING THE SCION

A. Remove leaves next to the bud.

B. Remove bud from twig carefully.

IX. Transparency -- SHIELD OR T BUDDING - PREPARING THE STOCK

A. Carefully make a T-shaped cut through the bark.

B. Also called shield budding because the flaps shield the bud.

X. Transparency -- T BUDDING - SUCCESSFUL GROWTH OF THE BUD

A. When the bud shows growth the stock is gradually cut back on the budding point.

XI. Transparency -- WHIP AND TONGUE GRAFT - PREPARING THE STOCK

A. An angle cut is made. Note: It should be the same size as the angle cut made to the stock.

B. Identical lengthwise cut through the stem.

XIII. Transparency -- WHIP AND TONGUE GRAFT - UNITING STOCK AND SCION

A. The tongues are interlocked.

B. The graft is tied together.

SAMPLE TEST QUESTIONS AND TEACHER'S KEY

PROPAGATING WOODY PLANTS BY BUDDING AND GRAFTING

TRUE OR FALSE:

False 1. Scion refers to the lower portion of the plant, including the root system.

False 2. Grafting fruit trees is not commercially profitable.

True 3. It is important to follow sanitary procedures when grafting.

False 4. All plants can be grafted successfully.

True 5. A natural graft can be caused by two branches that are in close contact with each other.

False 6. It takes at least 9 months for callus tissue to begin forming.

True 7. It is important to match cambium layers when grafting.

True 8. Shield budding and T-Budding are the same.

True 9. A sharp knife is extremely important in grafting.

False 10. Plant characteristics cannot be changed by grafting.

SHORT ANSWER:

11. List three reasons why one would propagate a plant by graftage.

    A. ornamental purposes

    B. promote fruit or nut production

    C. improve disease resistance

12. Define cambium layer. Why is the cambium layer important for a successful graft union?

    The cambium layer is a group of cells located between the cortex and the pith. In order for a graft union to be successful, the cambium layers must come in contact between the stock and scion. They are part of the vascular system of the plant and the origin of all plant growth.

13. Explain the 3 major steps in making a T-Bud. Use illustrations if desired.

    1. Prepare the stock by making a T-shaped cut through the bark.

2. Prepare the scion - remove a bud with a leaf stem attached.

3. Insert the bud inside the flaps of the stock and wrap tightly with a rubberband. Be careful not to cover the bud with the rubberband.

MULTIPLE CHOICE:

B 14. Stock and scion become united through the development of

a. cambium layers.

b. callus tissue.

c. raffia.

d. none of the above.

C 15. Grafting will not be successful if

a. it takes place when the bark begins to slip.

b. two compatible plants are used.

c. two incompatible plants are used.

d. a & c.

C 16. The diameter of the rootstock must be

a. larger than the diameter of the scion.

b. stronger than the scion to support it.

c. equal to the diameter of the scion.

d. smaller than the diameter of the scion.

B 17. The cambium cells are located between

a. the bark and the cortex.

b. the cortex and the pith.

c. the stock and the scion.

d. none of the above.

UNIT F: PLANT IDENTIFICATION

PROBLEM AREA: REVIEWING AND APPLYING PLANT IDENTIFICATION SKILLS

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with eleventh grade or third year students in a horticultural occupations program. The recommended time for teaching this problem area is during the spring semester prior to job placement and/or state horticultural contests.

This problem area was written based on the assumption that instructors have already taught plant identification skills utilizing Metropolitan Core Curriculum I and II, Unit F - Plant Identification. It is also assumed that instructors have reemphasized plant identification by concentrating on a few plants at a time throughout the entire school year. Therefore, the estimated instructional time for this problem area is 2-4 days, depending on how much the teacher feels review of identification skills is necessary and/or the availability of actual plant material for review.

Since reviewing of skills often has little motivational value for students, this unit of instruction has been set up to prepare students for an identification skills contest. It is hoped that the incentive of winning a contest whether on the local, sectional or state level will increase the students' motivation, as well as give them the opportunity to apply identification skills. This problem area by no means is meant to encourage instructors to teach for the winning of contests, but is meant to be used only as an instructional and motivational tool.

The use of advisory council members, local horticultural businesspersons and/or horticultural/FFA club officers as resource people is encouraged in teaching this problem area. A local search to locate other supplementary materials for use with this problem area is suggested. The items in this problem area are for reference or modification as the instructor adapts these materials to their local situation.

CREDIT SOURCES:

These materials were developed through a funding agreement, R-33-13-D-0362-466 with the Illinois State Board of Education, Department of Adult, Vocational and Technical Education, Research and Development Section, 100 North First Street, Springfield, Illinois 62777. Opinions expressed in these materials do not reflect, nor should they be construed as policy or opinion of the State Board of Education or its staff.

The teacher's guide and information sheets were developed by Marianne Ringger, Department of Vocational and Technical Education, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Metropolitan Core Curriculum Field Test Teachers.

TEACHER'S GUIDE

I. Unit: Plant identification

II. Problem area: Reviewing and applying plant identification skills

III. Objectives: At the close of this problem area students will be able to identify a group of:

1. bulbs or underground stems
2. garden annuals
3. perennials
4. foliage plants
5. deciduous shrubs
6. deciduous trees
7. coniferous plants
8. broadleaf evergreens
9. ground covers.

IV. Suggested interest approaches:

1. Inform students of a class, school, sectional, and/or state horticultural plant identification contest. Describe the contest rules, procedures and awards to be given.

2. Invite a local nursery person to talk about why plant identification skills are necessary and how students can develop good skills.

3. Compile a list of horticultural jobs in which identification skills are essential. Have students list specific identification skills for each job.

4. Give students a pre-test on plant identification skills. Allow the students to set a goal of improvement for a post-test and give a certificate of achievement for significant improvement.

V. Anticipated problems and concerns of students:

1. What plant identification skills do we need to develop?

2. What activities can we do to improve our plant identification skills?

3. What specific characteristics of plants are utilized in plant identification?

VI. Suggested learning activities and experiences:

1. Set up learning centers with live examples of plant material to be identified and allow students to work independently or in small groups to review plant identification skills. Plant materials can be grown in the school greenhouse, nursery or arboretum.

2. Show slidefilms listed in the Reference and Aids section of Metropolitan Core Curriculum I and II, Unit F - Plant Identification.

3. Take a field trip to a local nursery and practice plant identification skills.

4. Practice plant identification skills by identifying plant material on the school grounds.

5. Have students make a collection of leaves to be used for future plant identification reference.

6. Have students fill out identification flash cards for each plant. Set up a plant identification skill contest for each class or the horticulture/FFA club. Winners could be sent to sectional or state level FFA horticulture contests.

7. Award certificates of merit to students who win the plant identification contest or for those who reach their improvement goal.

8. Utilize advisory committee members, local horticultural businesspersons, and/or other school personnel in setting up and conducting a plant identification contest.

VII. Application procedures:

1. The material in this problem area will be applied to the development and improvement of plant identification skills.

2. Students will apply their knowledge of plant identification in local, sectional, and/or state horticultural contests.

3. Plant identification skills will be used by students involved in S.O.E. programs.

VII. Application procedures:

1. The material in this problem area will be applied to the development and improvement of plant identification skills.

2. Students will apply their knowledge of plant identification in local, sectional, and/or state horticultural contests.

3. Plant identification skills will be used by students involved in S.O.E. programs.

VIII. Evaluation:

1. Conduct a practical identification test or contest using visual samples of selected plant material.

IX. References and aids:

1. Illinois Association of Vocational Agriculture Teachers General Rules for IAVAT Contests available from IAVAT Executive Office, 204 Husseman Street, Box 466, Roanoke, Illinois 61561.

2. IAVAT Contest Rules for Ornamental Horticulture available from IAVAT Executive Office, 204 Husseman Street, Box 466, Roanoke, Illinois 61561.

3. Metropolitan Core Curriculum I and II, Unit F - Plant Identification.

INFORMATION SHEET 1

PLANT IDENTIFICATION CARD

COMMON NAME ____________________ SCIENTIFIC NAME ________________

CLASSIFICATION: __________________

CHARACTERISTICS:

FOLIAGE:

FLOWER:

FORM OR SHAPE:

SPECIAL CHARACTERISTICS:

PLANT IDENTIFICATION CARD

COMMON NAME ____________________ SCIENTIFIC NAME ________________

CLASSIFICATION: __________________

CHARACTERISTICS:

FOLIAGE:

FLOWER:

FORM OR SHAPE:

SPECIAL CHARACTERISTICS:

INFORMATION SHEET 2

SUGGESTED PLANT IDENTIFICATION LIST

CONIFEROUS PLANTS

1. Andorra Creeping Juniper (Juniperus horizontalis "Plumosa")
2. Pfitzer Chinese Juniper (Juniperus chinensis "Pfitleriana")
3. Bald Cypress (Taxodium distichum)
4. Norway Spruce (Picea abies)
5. Yew (Taxus species)
6. Douglas Fir (Pseudotsuga taxifolia)
7. Larch (Larix species)
8. American Arborvitae or Eastern Arborvitae (Thuja occidentalis)
9. Scotch Pine (Pinus sylvestris)
10. Eastern White Pine (Pinus strobus)
11. Swiss Mountain Pine or Mugo Pine (Pinus mugo)
12. Balsam Fir (Abies balsameor)
13. Eastern Redcedar (Juniperus virginiana)
14. Blue Colorado Spruce (Picea pungens "Glauca")

BROADLEAF EVERGREENS

1. Azalea (Rhododendron species)
2. Rhododendron (Rhododendron species)
3. Big Leaf Wintercreeper "Euonymus" (Euonymus vegetus)
4. American Holly (Ilex opaca)
5. Meserve Holly (Ilex x meserveae)
6. Chinese Holly (Ilex cornuta)
7. American Boxwood (Buxus sempervirens)
8. Yucca (Yucca species)
9. Oregon Grapeholly (Mahonia aquifolium)

INFORMATION SHEET 2 - Continued

DECIDUOUS SHRUBS

1. Red Twig Dogwood (Cornus stolonifera)
2. Flowering Dogwood (Cornus florida)
3. Common Lilac (Syringa vulgaris)
4. Amur Privet (Ligustrum amurense)
5. Honeysuckle (Lonicera species)
6. Burning Bush or Dwarfed Winged Euonymus (Euonymus alatus "compactus")
7. Arrowwood Viburnum (Viburnum dentatum)
8. European Cranberrybush Viburnum (Viburnum opulus)
9. Forsythia (Forsythia species)
10. Spreading Cotoneaster (Cotoneaster divaricata)
11. Rock Cotoneaster or Rockspray Cotoneaster (Cotoneaster horizontalis)
12. Green Barberry or Japanese Barberry (Berberis thunbergii)
13. Russian-Olive (Elaeagnus angustifolia)
14. Hawthorn (Crataegus species)
15. Alpine Currant (Ribes alpinum)
16. Golden St. Johnswort (Hypericum frondosum)
17. Meyer Lilac (Syringa meyeri)
18. Goldflame Spirea (Spiraea x bumalda "Gold flame")
19. Anthony Waterer Spirea (Spiraea x bumalda "Anthony Waterer")
20. Bush Cinquefoil (Potentilla fruticosa)
21. Purpleleaf Sand Cherry (Prunus x cistena)
22. American Cranberrybush Viburnum (Viburnum trilobum)
23. Koreanspice Viburnum (Viburnum carlesii)
24. Hedge Cotoneaster (Cotoneaster lucida)
25. Bridalwreath spirea (Spiraea prunifolia)
26. Sweet Mockorange (Philadelpus coronarius)

INFORMATION SHEET 2 - Continued

DECIDUOUS SHRUBS - Continued

27. Common Flowering Quince (Chaenomeles speciosa)
28. Old Fashioned Weigela (Weigela florida)

DECIDUOUS TREES

1. White Birch (Betula alba)
2. River Birch (Betula nigra)
3. Silver Maple (Acer saccharinum)
4. Sugar Maple (Acer saccharum)
5. Red Maple (Acer rubrum)
6. Norway Maple (Acer platanoides)
7. Northern Red Oak (Quercus rubra)
8. White Oak (Quercus alba)
9. Pin Oak (Quercus palustris)
10. Bradford Callery Pear (Pyrus calleryana "Bradford")
11. Ginkgo (Ginkgo biloba)
12. American Sycamore (Platanus occidentalis)
13. American Elm (Ulmus americana)
14. Common Horse Chestnut (Aesculus hippocastanum)
15. Common Hackberry (Celtis occidentalis)
16. Common Honey Locust (Gleditsia triacanthos)
17. American Linden (Tilia americana)
18. Crimean Linden (Tilia x euchlora)
19. Little Leaf Linden (Tilia cordata)
20. Green Ash (Fraxinus pennsylvanica)
21. White Ash (Fraxinus americana)
22. Flowering Crabapple (Malus species)

INFORMATION SHEET 2 - Continued

DECIDUOUS TREES - Continued

23. American Mountain Ash (Sorbus americana)

24. Magnolia (Magnolia species)

25. Tulip Tree (Liriodendron tulipifera)

26. Paper Birch (Betula papyrifera)

27. Eastern Redbud (Cercis canadensis)

28. American Sweetgum (Liquidambar styraciflua)

29. Eastern Cottonwood (Populus deltoides)

30. Northern Catalpa (Catalpa speciosa)

31. European Mountain Ash (Sorbus aucuparia)

32. White Willow (Salix alba)

33. Black Walnut (Juglans Nigra)

34. European Beech (Fagus sylvatica)

GROUND COVERS

1. Purple Leaf Wintercreeper "Euonymus" (Euonymus fortunei)

2. Japanese Spurge (Pachysandra terminalis)

3. English Ivy (Hedera helix)

4. Myrtle or Periwinkle (Vinca minor)

5. Plantain-lily "Funkial" (Hosta species)

6. Blue Bugle-weed (Ajuga reptans)

7. Creeping Phlox (Phlox subulta)

8. Sedum (Sedum species)

9. Barren Strawberry (Waldsteinia ternata)

10. Sweet Woodruff (Galium ordoratum)

11. Kentucky Bluegrass (Poa pratensis)

12. Tall Fescue (Festuca arundinacea)

INFORMATION SHEET 2 - Continued

GROUND COVERS - Continued

13. Red Fescue (Festuca rubra)
14. Creeping Bentgrass (Agrostis palustris)
15. Boston Ivy
16. Morning-glory
17. Candytuft, evergreen
18. Goutweed
19. Hosta
20. Creeping Juniper
21. Lily-of-the-Valley
22. Japanese Wisteria
23. Virginia Creeper
24. Trumpetcreeper
25. Annual Bluegrass
26. Zoysia Grass
27. Perennial Ryegrass
28. Annual Ryegrass
29. Bermuda grass
30. Red Top

PERENNIALS

1. Baby's-Breath (Gypsophila paniculta)
2. Bleeding Heart (Dicentra spectabilis)
3. Columbine (Aquilegia species)
4. Lamb's Ear (Stachys Byzantina)
5. Lavender (Lavandula officinalis)
6. Oriental Poppy (Papaver oreintale)
7. Peony (Paeonia species)

INFORMATION SHEET 2 - Continued

PERENNIALS - Continued

8. Shasta Daisy (Chrysanthemum maximum)
9. Statice (Limonium sinuatum)
10. Yarrow
11. Butterfly Milkweed
12. Astilbe
13. Campanula
14. Pyrethum Daisy
15. Hardy Chrysanthemum
16. Coreopis
17. Delphinium
18. Foxglove
19. Globe Thistle
20. Gaillardia
21. Guanium
22. Coral Bells
23. Red Hot Poker
24. Liatris Gay Feather
25. Sweetpea
26. Lupine
21. Evening primrose
28. Hollyhock
29. Aster
30. Rudbeckla

GARDEN ANNUALS

1. Ageratum or Flossflower (Ageratum houstonianum)
2. Bachelor's Button or Cornflower (Centaurea cyanus)

INFORMATION SHEET 12 - Continued

GARDEN ANNUALS - Continued

3. Balsam or Touch-Me-Not (Impatiens balsamina)
4. Blue Salvia or Mealycup Sage (Salvia farinacea)
5. Carnation (Dianthus caryophyllus)
6. Cleome or Spider Plant (Cleome spinosa)
7. Cockscomb (Celosia argentea cristata)
8. Coleus (Coleus species)
9. Dusty Miller (Senecio cineraria)
10. Dwarf French Marigold (Tagetes patula)
11. Feather Celosia or Plume Celosia (Celosia argentea plumosa)
12. Flowering Tobacco (Nicotiana alata grandiflora)
13. Geranium or Zonal Geranium (Pelargonium x hortorum)
14. Gloriosa Daisy (Rudbeckia hirta gloriosa)
15. Gomphrena or Globe Amaranth (Gomphrena globosa)
16. Impatiens or Sultana (Impatiens wallerana)
17. Marigold (Tagetes erecta)
18. Nasturtium (Tropaeolum majus)
19. Periwinkle or Vinva (Catharanthus roseus)
20. Petunia (Petunia hybrida)
21. Rose Moss or Portulaca (Portulaca grandiflora)
22. Salvia or Scarlet Sage (Salvia splendens)
23. Snapdragon (Antirrhinum majus)
24. Sweet Alyssum (Lobularia maritima)
25. Verbena (Verbena x hybrida)
26. Wax Begonia or Fibrous-Rooted Begonia (Begonia semperflorens)
27. Zinnia (Zinnia elegans)
28. Cosmos

INFORMATION SHEET 2 - Continued

GARDEN ANNUALS - Continued

29. Fuchsia
30. Sunflower
31. Lantana
32. Lobelia
33. Pansy

BULBS OR UNDERGROUND STEMS

1. Begonia
2. Caladium
3. Canna
4. Crocus
5. Dahlia
6. Gladiolus
7. Hyacinth
8. Iris
9. Lily
10. Narcissus
11. Tulip

FOLIAGE PLANTS

1. Airplane Plant or Spider Plant (Chlorophytum comosum)
2. Aluminum Plant or Watermelon Pilea (Pilea cadierei)
3. Aphelandra or Zebra Plant (Aphelandra squarrosa)
4. Artillery Plant (Pilea serpyllacea)
5. Baby's Tears or Irish Moss (Soleirolia soleirolii)
6. Basket Asparagus or Asparagus Fern (Asparagus sprengeri)
7. Bird's Nest Fern (Asplenium nidus)

INFORMATION SHEET 2 - Continued

FOLIAGE PLANTS - Continued

8. Boston Fern (Nephrolepis exaltata bostoniensis)
9. Chinese Evergreen or Aglaonema (Aglaonema modestum)
10. Christmas Cactus (Schlumbergera bridgesii)
11. Croton (Codiaeum variegatum pictum)
12. Dumbcane (Dieffenbachia species)
13. Devil's Ivy (Epipremnum aureum)
14. Emerald Ripple Peperomia (Peperomia caperata)
15. English Ivy (Hedera helix)
16. False Aralia (Dizygotheca elegantissima)
17. Fiddleleaf Fig (Fiscus lyrata)
18. Grape Ivy (Cissus rhombifolia)
19. Heartleaf Philodendron (Philodendron scandens oxycardium)
20. Jade Plant or Chinese Rubber Plant (Crassula argentea)
21. Japanese Fatsia or Japanese Aralia (Fatsia japonica)
22. Mother-in-Laws Tongue or Sansevieria (Sansevieria trifasciata)
23. Neanthe Bella Dwarf Palm or Parlor Palm (Chamaedorea elegans)
24. Nephthytis, Trileaf Wonder of Arrowhead Vine (Syngonium podophyllum)
25. Norfolk Island Pine (Araucaria heterophylla)
26. Peace Lily (Spathiphyllum floribundum)
27. Peperomia or Pepper Face (Peperomia obtusifolia)
28. Pan-American Friendship Plant (Pilea involucrata)
29. Polka-Dot-Plant or Freckle-Face (Hypoestes sanguiinolenta)
30. Prayer Plant or Rabbit Tracks (Maranta leuconeura kerchoveana)
31. Rubber Plant (Fiscus elastica)
32. Sander's Dracaena (Dracaena sanderiana)
33. Philodendron or Swiss Cheese Plant (Monstera deliciosa)
34. Schefflera (Brassaia actinophylla)

INFORMATION SHEET 2 - Continued

FOLIAGE PLANTS - Continued

35. Spotted-leaf Dracaena (Dracaena godseffiana)
36. Stawberry Begonia or Strawberry Geranium (Saxifraga sarmentosa)
37. Tree Ivy or Botanical Wonder (Fatshedera lizei)
38. Warneckei Dracaena (Dracaena deremensis "Warneckei")
39. Watermelon Peperomia (Peperomia argyeia)
40. Weeping Fig (Fiscus benjamina)
41. Swedish Ivy (Plectranthus australis)

UNIT G: GROWING HORTICULTURAL CROPS

PROBLEM AREA: GROWING SMALL FRUITS AND BRAMBLES

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with eleventh-grade or third-year students in a horticultural or agricultural occupations program. The recommended time for teaching this problem area is during the spring semester.

The estimated instructional time for this problem area is 3 to 5 days, depending on how far the teacher wishes to go in developing skills on growing small fruits and brambles. If the teaching plan is limited to classroom discussion with little or no practice or observation, the instructional time can be 3 days or less. If the students are to be involved in other activity exercises, the instructional time will need to be increased.

The instructor is encouraged to conduct a local search to locate other supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt this problem area to their local situation.

CREDIT SOURCES:

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The teacher's guide, student information sheets, student worksheets, and sample test questions were developed by Marcia Watman-Lauchner and Susan Osborne, and the competency sheet was developed by Al Zwilling, Department of Vocational and Technical Education, University of Illinois. Transparency masters were prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Metropolitan Core Curriculum Field Test Teachers.

TEACHER'S GUIDE

I. Unit: Growing horticultural crops

II. Problem area: Growing small fruits and brambles

III. Objectives: At the close of this problem area, students will be able to:

1. Recognize small fruit varieties grown in Illinois
2. Prepare a site for growing small fruits and brambles
3. Plant and maintain strawberries, grapes, blueberries, blackberries and raspberries
4. Identify, prevent, and control insects, diseases and weeds affecting small fruits and brambles
5. Identify and utilize approved training methods and pruning practices on strawberries, grapes, blueberries, and brambles
6. Harvest small fruits and brambles.

IV. Suggested interest approaches:

1. Ask the students what small fruits they like and if they have ever grown them at home.
2. Bring in samples of small fruits for students to identify and taste.
3. Bring in a sample plant or illustration of each small fruit type to be discussed in class, and ask students to identify them.

V. Anticipated problems and concerns of students:

A. Strawberries

  1. How do I choose a variety to plant?
  2. What is the best site for strawberries?
  3. When and how do I plant strawberries?
  4. Do strawberries need full sun?
  5. How much water do strawberries need?
  6. Do strawberries need organic matter?
  7. What type of fertilizer do strawberries need?

8. Why should I mulch strawberry plants?

9. How do you prevent and control insects, diseases and weeds from damaging your strawberry crop?

10. Why do I remove strawberry flowers the first year?

11. Why do strawberries need a training system?

B. Grapes

1. What is the difference between American and European grapes?

2. Why are some grapes seedless?

3. What is the best site for growing grapes?

4. What is the training system for grapes?

5. Why are grapes grown on a trellis?

6. How much water and fertilizer do grapes need?

7. How do you prevent and control insects, diseases and weeds affecting your vineyards?

8. When and how are grapes harvested?

9. How are raisins made?

C. Blueberries

1. Do blueberries require a certain pH?

2. How can the soil be adjusted for an acid pH?

3. What type of drainage do blueberries need?

4. Why are mulches so important for blueberries?

5. How do I plant blueberries?

6. When and how should blueberries be pruned?

7. How do you prevent and control birds, insects, diseases and other pests from damaging your blueberry crop?

8. When and how are blueberries harvested?

D. Brambles: Raspberries and Blackberries

1. Are there thornless bramble plants?
2. What is the difference between a raspberry and a blackberry?
3. Why should raspberries and blackberries be grown 1000 feet from each other?
4. Why is it important to avoid an area previously grown with solanaceous crops (ex. tomatoes, potatoes, tobacco)?
5. How much organic matter do brambles need?
6. How much water do brambles need?
7. Should brambles be mulched?
8. How do you prevent and control insects, diseases and weeds affecting brambles?
9. Are there training systems for brambles?
10. How and when are brambles pruned?
11. How and when are brambles harvested?

VI. Suggested learning activities and experiences:

1. Have a student who grows small fruits at home report on the scope, care and maintenance of these fruits.
2. Provide students with information on spacings of fruits, yield per plant, and number of plants needed for a family of five. Have students extrapolate to their own family size and approximate what size area would be needed for each small fruit crop.
3. Conduct a brainstorming session with students on the factors to consider when selecting a location to grow small fruits and brambles. Have students study their own home landscape, choose a location to grow small fruits, and/or brambles and list the reasons for selecting the location.
4. Have students complete Student Worksheet 1 - Selecting and Preparing a Site for Small Fruits and Brambles Using VAS Units 5026 and 5027 as references.
5. Bring in samples of different types of soil. Give students the pH level and nutrient content of each soil sample. Ask students if the soil is adequate for the growth of various small fruits and brambles. If not, ask the students how they would prepare the soil.

6. Have students bring in a soil sample from a location at their home that may be a potential site for small fruit. Send the soil to a soil testing station (consult your county extension advisor for locations) and have tests done for pH and nutrient levels. Discuss the results with the class and prepare recommendations.

7. Have students complete Student Worksheet 2 - My Home Small Fruit Planting. Students can draw a rough outline or complete the project on regular landscaping paper.

8. Provide students with lists of Illinois cultivars and certified nurseries. Have each student send away for one catalog, making sure that most of the nurseries will be used. Once this information is returned, provide students with the table on page 5 of Circular 935, Growing Small Fruits in the Home Garden. Using these references, students should complete Worksheet 3 - Comparison of Small Fruit Varieties. Each student should choose two different varieties of each fruit that will be grown in their chosen location at home.

9. If this problem area is taught during the fall semester, take students on a field trip to a Pick-Your-Own raspberry farm. If taught in spring, take students to a Pick-Your-Own strawberry farm. Arrange for the owner or manager to speak with the students about the planning and maintenance of a commercial small fruit business. Students should be allowed to pick and purchase some fruit.

10. Arrange for a commercial small fruit grower to talk to students about starting and managing a commercial small fruit operation.

11. Distribute the Fruit or Vegetable Production Record Book to students that want to work on a problem. Growing small fruits takes more than one, maybe two seasons for a successful fruit crop. The Problem For Use With Fruit or Vegetable Production Record Book can help the student with the factors that should be considered. The problem is for a vegetable garden, so adaptations will need to be made.

12. Purchase a lot of 100 strawberry plants. Have students practice the planting and spacing of these plants. Upon completion of this exercise, the students can take their plants home to add to their S.O.E.P., using My Plant Diary or the Fruit and Vegetable Production Record Book. Remaining plants can be set on the school grounds or in the greenhouse and used as a teaching aid in future years.

13. Use the transparencies and transparency discussion guide included in this problem area along with actual plant material to demonstrate the proper method of planting and maintaining small fruits and brambles.

14. Have students construct models of the various small fruit and bramble training systems.

15. Demonstrate pruning, training and renovation techniques for small fruits and brambles. Allow students to practice these techniques. Have students complete Student Worksheet 4 - Pruning and Training Brambles using VAS Unit 4048 as a reference.

16. Have students complete Student Worksheet 5 - Planting, Culture and Harvest of Small Fruits and Brambles using VAS Units 5026 and 5027 as references.

17. Demonstrate the proper way to transplant small fruits.

18. Provide samples of various mulches commonly used with small fruits. Compare the characteristics, quality and price of each type of mulch.

19. Discuss the importance of watering and irrigating small fruits and brambles.

20. Show students pictures or bring in actual samples of small fruits and brambles damaged by insects, disease or excessive weeds. Using Circular 1145, Home Fruit Pest Control, have students plan a pest prevention/control schedule.

21. Have specimens or pictures of the most common weeds in small fruit sites. Conduct an identification test on these weeds.

22. Make a display of the equipment used for applying chemicals for commercial and home use. Demonstrate how to use and calibrate (if necessary) the applicators. Prepare a safety demonstration for use of this equipment.

23. Provide empty containers of fungicides, insecticides, and grass and broadleaf herbicides. Discuss the proper use of these chemicals.

24. Bring in small fruit samples at various stages of development. Have students taste the fruit. Ask students why they selected the various pieces of fruit they ate. Discuss when and how small fruits should be harvested. Show students commercial mechanical harvesters by means of audio-visuals or a field trip.

25. Use the Competency Inventory to discuss entry level requirements for work in the small fruit and brambles field. Have students complete the competency sheet at the end of the unit, so they can assess their progress.

VII. Application procedures:

1. The skills learned in this problem area can be utilized in the home garden.
2. The skills learned in this problem area can be used by students who plan to work in a fruit nursery or garden center.

VIII. Evaluation:

1. Collect and grade student worksheets.
2. Administer written test upon completion of the problem area utilizing sample test questions included with this problem area.
3. Evaluate students on planning a small fruit garden, consider factors such as site selection, hardiness and vigor of chosen cultivars, selected training systems, et cetera.
4. Check student progress through use of the Competency Inventory.

IX. References and aids:

1. Vocational Agriculture Service, University of Illinois, 1401 South Maryland Drive, Urbana, Illinois 61801
   a. VAS Unit 4048: Pruning and Training Bramble Fruits and Highbush Blueberries
   b. VAS Unit 5026: Growing Raspberries and Blackberries in the Midwest
   c. VAS Unit 5027: Growing Strawberries
   d. Fruit or Vegetable Production Record Book
   e. Problem for Use with Fruit or Vegetable Production Record Book
2. Cooperative Extension Service, College of Agriculture, University of Illinois, Urbana, Illinois 61801
   a. Circular 935: Growing Small Fruits in the Home Garden
   b. Circular 1144: Controlling Weeds in Home Fruit Plantings
   c. Circular 1145: Home Fruit Pest Control
3. All About Growing Fruits and Berries, Ortho Books, Midwest/Northeast Edition. Chevron Chemical Company, 575 Market Street, San Francisco, CA 94105. This publication is available at most garden centers.

4. Competency inventory
5. Selected information sheets
6. Selected student worksheets
7. Selected transparencies

COMPETENCY INVENTORY

GROWING SMALL FRUITS

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

Competency	Circle One						
1. Prepare the soil for planting small fruits	1	2	3	4	5		
2. Prepare the site for planting small fruits	1	2	3	4	5		
3. Plant sets according to plans	1	2	3	4	5		
4. Water newly planted sets	1	2	3	4	5		
5. Take soil samples	1	2	3	4	5		
6. Apply fertilizer	1	2	3	4	5		
7. Apply insecticides and fungicides	1	2	3	4	5		
8. Prune small fruits	1	2	3	4	5		
9. Provide small fruits with winter protection	1	2	3	4	5		
10. Control unwanted vegetation with herbicides	1	2	3	4	5		
11.							
12.							
13. Select appropriate varieties of small fruits						6	7
14. Select appropriate planting sites						6	7
15. Select an appropriate system for training each fruit						6	7
16. Determine the optimum time to harvest crop						6	7
17. Determine most appropriate method of harvesting						6	7
18. Identify outlets for fruit products to be marketed						6	7

These competencies outlined in the National Ag Occupations Competency Study are for entry level positions in agricultural/horticultural production.

Name ______________________ Date

INFORMATION SHEET 1

SMALL FRUIT VARIETIES SUGGESTED FOR THE GEOGRAPHICAL REGIONS OF ILLINOIS

Crop	Southern IL	Central IL	Northern IL
Strawberries	Earliglow Sunrise Surecrop Redchief Raritan Cardinal	Earliglow Sunrise Honeoye Surecrop Redchief Raritan	Earliglow Sunrise Honeoye Surecrop Redchief Guardian Raritan Sparkle
Red Raspberry	Heritage September Fallred	Heritage September Fallred	Latham Heritage September
Black Raspberry	Bristol Allen	Bristol Allen Jewel (trial)	Bristol Allen Jewel (trial)
Purple Raspberry	Clyde Brandywine	Clyde Brandywine	Clyde Brandywine
Grapes (American)	Fredonia Buffalo Niagara Steuben Concord Catawba Delaware	Fredonia Niagara Concord Delaware	Fredonia Concord
Grapes (French Hybrid: trial)	Vignoles Foch Baco Noir Seyval DeChaunac	Vignoles Foch Baco Noir Seyval DeChaunac	none
Thornless Blackberries	Dirksen Black Satin Hull	Dirksen Black Satin Hull	none
Blueberries	Collins Bluecrop Blueray Jersey Berkeley Herbert Coville Lateblue	Collins Bluecrop Blueray Jersey Berkeley Herbert Coville Lateblue	Collins Bluecrop Blueray Jersey Berkeley Herbert Coville Lateblue

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[1] Varieties are listed from the earliest to latest ripening order.

INFORMATION SHEET 2

SELECTED SOURCES OF SMALL FRUIT PLANTS[1]

General Nurseries

They offer strawberries, blackberries, raspberries, grapes, blueberries, currants, and gooseberries, in addition to ornamentals and tree fruits.

AHRENS NURSERY, Rt. 1, Huntingburg, IN 47542
BOATMAN'S NURSERY & SEED CO., Bainbridge, OH 45612
BOUNTIFUL RIDGE NURSERIES, INC., Princess Anne, MD 21853
BURGESS SEED AND PLANT CO., Galesburg, MI 49053
BURPEE SEED CO., Clinton, IA 52732
EMLONG NURSERIES, INC., Stevensville, MI 49127
FARMER SEED AND NURSERY CO., Fairbault, MN 55021
EARL FERRS NURSERY, Hampton, IA 50441
FRENCH NURSERY CO., Clyde, OH 43410
GURNEY SEED AND NURSERY CO., Yankton, SD 57078
HILLEMEYER NURSERIES, Lexington, KY 40500
IDEAL FRUIT FARM AND NURSERY, Stilwell, OK 74960
INTER-STATE NURSERIES, INC., Hamburg, IA 51640
KELLY BROS. NURSERIES, Dansville, NY 14437
KRIDER NURSERIES, INC., Middlebury, IN 46549
J.E. MILLER NURSERIES, 5060 West Lake Road, Canandaigua, NY 14424
MONROE NURSERY CO., Monroe, MI 48161
NEOSHO NURSERIES, Neosho, MO 64850
NEW YORK STATE FRUIT TESTING COOPERATIVE ASSN., Geneva, NY 14456
OZARK NURSERY, Tahlequah, OK 74464

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[1] This is a partial list of nurseries and seed companies that offer small fruit for sale. Interested persons should obtain catalogs from several nurseries before choosing. The nurseries listed under the small fruit type offer a wide selection of cultivars for that crop. For cultivar recommendations, consult your county extension adviser in Agriculture or write to the Department of Horticulture, 124 Mumford Hall, 1301 West Gregory, Urbana, Illinois 61801.

Selected Sources of Small Fruit Plants (cont'd.)

SCARFF'S NURSERY, INC., New Carlisle, OH 45344
STARK BROS. NURSERIES AND ORCHARDS CO., Louisiana, MO 63353
STERN'S NURSERIES, Geneva, NY 14456
TENNESSEE NURSERY CO., INC., Cleveland, TN 36311

BLUEBERRIES

J. HERBERT ALEXANDER, Middleboro, MA 02346
A. G. AMMON NURSERY, Box 488F, Chatworth, NJ 08019
BLUEBERRY HILLS, Rt. 5, Rogers, AR 72756
D.A. BYRD, Lacota, MI 49063
FINCH'S BLUEBERRY NURSERY, Bailey, NC 27807
GALLETA BROS. BLUEBERRY FARMS, Hammonton, NJ 08037
HARTMANN'S PLANTATION, Grand Junction, MI 49056
KEEFE BLUEBERRY PLANTATION, Grand Junction, MI 49056
MICHIGAN BLUEBERRY GROWER'S ASSN., Grand Junction, MI 49056
THOMAS AND PATRICK O'BRIEN, RR 2, BOX 147B, South Haven, MI 49090
RIVER VIEW NURSERY, McMinnville, TN 37110

BLACKBERRIES AND RASPBERRIES[2]

DALE BASHAM NURSERY, Alma, AR 72921
BOUNTIFUL RIDGE NURSERIES, INC., Princess Anne, MD 21853
CONGDON AND WELLER NURSERY, Mile Block Road, North Collins, NY 14111
RAYNER BROS., INC., Salisbury, MD 21801
THEODORE STEGMAIER NURSERY, Rt. 4, Cumberland, MD 21502

CURRANTS AND GOOSEBERRIES

FOSTER NURSERY CO., INC., Fredonia, NY 14063
SOUTHMEADOW FRUIT GARDENS, 2363 Tilbury Place, Birmingham, MI 48009

ELDERBERRIES

NEW YORK STATE FRUIT TESTING COOPERATIVE ASSN., Geneva, NY 14456

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[2] Raspberry plants should be designated as "essentially virus-free." Such plants are definitely superior.

Selected Sources of Small Fruit Plants (cont'd.)

GRAPES

BOORDY VINEYARD, Box 38, Riderwood, MD 21139

CHALET DU LAC VINEYARDS AND NURSERY, Rt. 1, Box 9F, Altus, AR 72821 (Hybrids)

FOSTER NURSERY CO., INC., 69 Orchard Street, Fredonia, NY 14063

JOHNSTON VINEYARDS, 4320 North Barnes, Oklahoma City, OK 73112

SOUTHEAST NURSERIES, Box 321-A, Raleigh, NC 27609

SOUTHMEADOW FRUIT GARDENS, 2363 Tilbury Place, Birmingham, MI 48009

STRAWBERRIES[3]

AHRENS NURSERY, Rt. 1, Huntingburg, IN 47542

W.F. ALLEN CO., PO Box 1577, Salisbury, MD 21801

JAMES W. BRITTINGHAM, 2538 Ocean City Boulevard, Salisbury, MD 21801

E.J. BRYAN, Washburn, WI 54891

BUNTING'S NURSERIES, INC., Shelbyville, DE 19975

CHAPMAN BERRY FARM, East Leory, MI 49051

THE CONNOR CO., INC. PO Box 534, Augusta, AR 72006

LEWIS STRAWBERRY NURSERY, Rocky Point, NC 28457

MULLINS PLANT FARMS, 410 Brookfield Avenue, Chattanooga, TN 37411

NEW JERSEY SMALL FRUITS COUNCIL, INC., PO Box 185, Hammonton, NJ 08037

NOURSE FARMS, INC., Box 485, South Deerfield, MA 01373

RAYNER BROTHER, INC., Salisbury, MD 21801

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[3] Strawberry plants should be designated as "essentially virus-free." Such plants are definitely superior.

STUDENT WORKSHEET 1

SELECTING AND PREPARING A SITE FOR SMALL FRUITS AND BRAMBLES

References - VAS Unit 5026 - Growing Raspberries and Blackberries in the Midwest
VAS Unit 5027 - Growing Strawberries

1. What is the difference between blackberries and raspberries and what is the term that refers to both plants?

2. Do brambles prefer full shade, partial shade or full sunlight?

3. Name 3 major factors to consider when selecting a site to grow brambles.

   A.

   B.

   C.

4. Brambles should be planted in soil that is ______________________ and high in ________________.

5. Why should brambles not be planted in areas where solenaceous crops (potatoes, tomatoes, peppers, tobacco) have previously been grown?

6. Why should raspberries and blackberries never be planted together, and how far apart should they be planted?

7. How far in advance should you begin preparing the site selected for growing brambles?

8. What should the soil pH be for growing brambles?

9. What type of soil is the best for growing strawberries, and why is drainage important?

10. Why should strawberries not be planted in areas where solenaceous crops (potatoes, peppers, tomatoes and corn) have previously been grown?

11. Name 2 reasons why a site with a gentle slope is suitable for strawberries.

12. Name 4 reasons for fumigating the soil prior to planting strawberries.

    A.

    B.

    C.

    D.

13. What should the soil pH be for growing strawberries?

14. Should you apply lime directly on established strawberries to raise the pH? Why or why not?

15. Describe a 4-step recommended rotation to precede strawberry establishment.

    A.

    B.

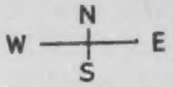
    C.

    D.

STUDENT WORKSHEET 2

MY HOME SMALL FRUIT PLANTING

INSTRUCTIONS: Draw a basic outline of your home grounds. Allow ¼ inch for every 1 foot. Show the placement of your home, existing trees, shrubs, perennial flowers, sidewalks, patios and driveways. Select two different types of small fruits and indicate where you would plant them.



STUDENT WORKSHEET 3

COMPARISON OF SMALL FRUIT VARIETIES

Fruit Type (List two different varieties for each)	Planting Distance Between Rows	Planting Distance Between Plants	Time Interval from Planting to Fruiting	Approx. Life of Plants	Height of Mature Plant
Strawberry 1. 2.					
Raspberry 1. 2.					
Blackberry 1. 2.					
Blueberry 1. 2.					
Grape 1. 2.					

STUDENT WORKSHEET 3 - Continued

Fruit Type (List two different varieties for each)	Estimated Annual Yield Per Plant	Suggested No. of Plants for Family of Five	Cost of Plants	Quality Characteristics	Size and Durability of Fruit	Plant Hardiness
Strawberry 1. 2.						
Raspberry 1. 2.						
Blackberry 1. 2.						
Blueberry 1. 2.						
Grape 1. 2.						

STUDENT WORKSHEET 4

PRUNING AND TRAINING BRAMBLES

Reference - VAS Unit 4048 - Pruning and Training Bramble Fruits and Highbush Blueberries

1. Name 3 tools used for pruning brambles and the major purpose of each.

   A.

   B.

   C.

2. How should pruning tools be cared for after their use?

3. How often and when are red and yellow raspberries pruned each year?

4. How often and when are black and purple raspberries and erect blackberries pruned each year?

5. How often and when are semi-erect and trailing blackberries pruned each year?

6. How often and when are highbush blueberry plants pruned each year?

7. When is the best time to spring prune brambles?

8. When is the best time to remove fruited canes from bramble plants? Why?

9. What should be done with the fruited canes pruned from the plant?

10. How many canes should remain on a red or yellow raspberry plant growing in the hill and other training systems after spring pruning?

11. When pruning everbearing varieties of red and yellow raspberries should the shoots that bear fruit in the fall be removed after harvest? Why or why not?

12. How many canes should remain on black or purple raspberries or erect blackberries after spring pruning, and what should be done with the lateral branches?

13. How should black or purple raspberries and erect blackberries be pruned during the summer?

14. After spring pruning how many canes should remain on semi-erect and trailing blackberries?

15. Name 3 different training systems for brambles.

16. Name 3 advantages of using some type of training system when growing brambles.

    A.

    B.

    C.

17. Which bramble training systems are the most practical for a large scale planting of brambles?

18. Which bramble training system does not require the tying of canes?

19. What is the most common system of training brambles and which type of wire trellis is used?

20. Which bramble training system is most useful in home garden plots? Why?

STUDENT WORKSHEET 5

PLANTING, CULTURE, AND HARVESTING OF SMALL FRUITS AND BRAMBLES

Reference - VAS Unit 5026 - Growing Raspberries and Blackberries in the Midwest
VAS Unit 5027 - Growing Strawberries

1. When can brambles be planted?

2. What type of fertilizer should be used when planting brambles?

3. Name the three basic types of training systems for brambles.

   A.

   B.

   C.

4. When should strawberries be planted?

5. How deep should strawberries be planted?

6. What type of fertilizer should be used when planting strawberries?

7. Name the four basic types of training systems for strawberries.

   A.

   B.

   C.

   D.

8. How much water do strawberries and brambles require weekly?

9. How can weeds in brambles be controlled?

10. Name 2 reasons for mulching a strawberry planting.

11. Why are flower trusses removed from newly-set strawberries the first year they are planted?

12. What is the accepted practice for strawberry frost protection?

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13. When are bramble fruits ready for harvesting and what is the best time of day to pick them?

14. When are strawberries ready for harvesting and what is the best time of day to pick them?

15. Why should the caps be left on when picking strawberries?

TEACHER'S KEY - STUDENT WORKSHEET 1

SELECTING AND PREPARING A SITE FOR SMALL FRUITS AND BRAMBLES

References - VAS Unit 5026 - Growing Raspberries and Blackberries in the Midwest
VAS Unit 5027 - Growing Strawberries

1. What is the difference between blackberries and raspberries and what is the term that refers to both plants?

   Raspberries and blackberries are known as brambles. Plants with ripe fruit that slips easily from the receptacle are known as raspberries. Plants with ripe fruit that does not slip easily from the receptacle are known as blackberries.

2. Do brambles prefer full shade, partial shade or full sunlight?

   Brambles prefer full sunlight.

3. Name 3 major factors to consider when selecting a site to grow brambles.

   A. soil type

   B. air circulation, and

   C. previous crop history

4. Brambles should be planted in soil that is well-drained and high in organic matter.

5. Why should brambles not be planted in areas where solenaceous crops (potatoes, tomatoes, peppers, tobacco) have previously been grown?

   Brambles should not be planted where solenaceous crops have previously been grown because these crops are hosts to diseases that infect brambles. Some of these disease organisms can live in the soil for many years away from the solenaceous host plant.

6. Why should raspberries and blackberries never be planted together, and how far apart should they be planted?

   Raspberries and blackberries should be planted 600 to 1000 feet apart to lessen the chance of virus spreading between the plants.

7. How far in advance should you begin preparing the site selected for growing brambles?

   You should begin preparing the soil site at least one year prior to planting brambles.

8. What should the soil pH be for growing brambles?

The soil pH should be in the range of 5.5 to 7.5 for growing brambles.

9. What type of soil is the best for growing strawberries, and why is drainage important?

Strawberries grow best on a loam or sandy loam soil. A well-drained soil is important because standing water can kill strawberry plants in a short period of time.

10. Why should strawberries not be planted in areas where solenaceous crops (potatoes, peppers, tomatoes and corn) have previously been grown?

Strawberries should not be planted where solenaceous crops have previously been grown due to the chance of verticillium wilt carryover to the new strawberry planting. If strawberries are planted after corn, root aphids may be present and injure the strawberry roots.

11. Name 2 reasons why a site with a gentle slope is suitable for strawberries.

A site with a gentle slope is suitable for growing strawberries because
1) it allows surface water to drain quickly and
2) cold air will drain away to a lower level.

12. Name 4 reasons for fumigating the soil prior to planting strawberries.

A. to control root diseases, soil insects and weeds

B. to prevent plant losses

C. to produce higher yields, and

D. to reduce labor costs for weeding.

13. What should the soil pH be for growing strawberries?

The soil pH should be in the range of 6.0 and 6.5 for growing strawberries.

14. Should you apply lime directly on established strawberries to raise the pH? Why or why not?

Lime should not be applied directly to established strawberry plants because the calcium in lime can cause reduced plant growth and berry size.

15. Describe a 4-step recommended rotation to precede strawberry establishment.

Step A. plow the site in fall and sow rye or clover

Step B. plow the site in spring and raise cultivated vegetables or row crops (other than corn or those that carry verticillium wilt)

Step C. plow again in the fall and sow rye or clover, and

Step D. plow the cover crop under in the spring and plant strawberries.

TEACHER'S KEY - STUDENT WORKSHEET 4

PRUNING AND TRAINING BRAMBLES

Reference - VAS Unit 4048 - Pruning and Training Bramble Fruits and Highbush Blueberries

1. Name 3 tools used for pruning brambles and the major purpose of each.

   A. hand pruning shears - to cut back laterals and summer topping

   B. long-handled or lopping shears - to remove canes at ground level

   C. bramble hook - to remove canes at ground level

2. How should pruning tools be cared for after their use?

   Pruning tools should be cleaned and their cutting surfaces wiped with an oily cloth to prevent rust. Cutting surfaces must be kept sharp.

3. How often and when are red and yellow raspberries pruned each year?

   Red and yellow raspberries are pruned twice yearly, once in early spring and again after fruiting.

4. How often and when are black and purple raspberries and erect blackberries pruned each year?

   Black and purple raspberries and erect blackberries are pruned three times yearly, once in early spring, during the summer, and after fruiting.

5. How often and when are semi-erect and trailing blackberries pruned each year?

   Semi-erect and trailing blackberries are pruned twice yearly, once in early spring and after fruiting.

6. How often and when are highbush blueberry plants pruned each year?

   After the end of the third year in the field, highbush blueberry plants are pruned once a year during the dormant season (early spring is preferred).

7. When is the best time to spring prune brambles?

   Spring pruning should be done in early spring before the buds begin to swell, but after danger of severe cold is past.

8. When is the best time to remove fruited canes from bramble plants? Why?

   Fruited canes can be removed any time after harvest. Cutting the canes off immediately after harvest is the best time, because it facilitates new growth and reduces possible infestation of diseases and insects.

9. What should be done with the fruited canes pruned from the plant?

   They should be removed from the planting site and burned.

10. How many canes should remain on a red or yellow raspberry plant growing in the hill and other training systems after spring pruning ?

    5-8 canes should be left per stake in the hill system.

    Canes should be spaced 4-8 inches apart in the horizontal or vertical trellis training systems.

11. When pruning everbearing varieties of red and yellow raspberries should the shoots that bear fruit in the fall be removed after harvest? Why or why not?

    The shoots of everbearing varieties should not be removed after harvest, because these shoots will bear fruit again the next spring.

12. How many canes should remain on black or purple raspberries or erect blackberries after spring pruning, and what should be done with the lateral branches?

    Four to five canes should be left per plant and the lateral branches should be thinned out and shortened.

13. How should black or purple raspberries and erect blackberries be pruned during the summer?

    New shoots of black raspberries are pinched back 3-4 inches when they reach 24 inches in height. Purple raspberries and erect blackberries are pinched when they reach 30-36 inches in height. Shoots of both plants are allowed to grow an additional 6-8 inches more before pinching if grown with supports.

14. After spring pruning how many canes should remain on semi-erect and trailing blackberries?

    The best 4-8 canes are left on semi-erect varieties, and 8-16 canes are left on trailing varieties of blackberries.

15. Name 3 different training systems for brambles.

    The staked-hill system, vertical-type wire trellis and horizontal-type wire trellis are three training systems used for brambles.

16. Name 3 advantages of using some type of training system when growing brambles.

    A. facilitates harvesting and other cultural practices

    B. prevents crop losses due to breakage of canes by wind, cultivation and picking, and

    C. keeps the fruit on the canes cleaner.

17. Which bramble training systems are the most practical for a large scale planting of brambles?

    Wire trellising systems are the most practical for large scale plantings of brambles.

18. Which bramble training system does not require the tying of canes?

    The horizontal-type wire trellis system does not require the tying of canes.

19. What is the most common system of training brambles and which type of wire trellis is used?

    The hedgerow system is the most common system of training brambles and the horizontal-type wire trellis is used.

20. Which bramble training system is most useful in home garden plots? Why?

    The staked-hill system for training brambles is the most useful for home garden plots because a small power cultivator can be used, very little hand howing is needed, and the fruit is easy to pick.

TEACHER'S KEY - STUDENT WORKSHEET 5

PLANTING, CULTURE, AND HARVESTING SMALL FRUITS AND BRAMBLES

Reference - VAS Unit 5026 - Growing Raspberries and Blackberries in the Midwest
VAS Unit 5027 - Growing Strawberries

1. When can brambles be planted?

   Brambles can be planted as soon as the soil can be prepared in the spring.

2. What type of fertilizer should be used when planting brambles?

   A starter solution containing a 10-52-17 or 10-50-10 fertilizer should be used when planting brambles.

3. Name the three basic types of training systems for brambles.

   A. vertical wire trellis system

   B. horizontal wire trellis system

   C. the staked hill system

4. When should strawberries be planted?

   Strawberries should be planted in early spring so the plants can become established before hot weather.

5. How deep should strawberries be planted?

   Strawberries should be planted so that 1/3 of the crown is buried.

6. What type of fertilizer should be used when planting strawberries?

   A starter solution containing a 10-50-10 fertilizer should be used when planting strawberries.

7. Name the four basic types of training systems for strawberries.

   A. hill system

   B. broadcast system

   C. matted - row system

   D. spaced matted - row system

8. How much water do strawberries and brambles require weekly?

   Strawberries and brambles require 1 to 1½ inches of water weekly.

9. How can weeds in brambles be controlled?

   Weeds in brambles can be controlled with mulches of black plastic, straw or sawdust.

10. Name 2 reasons for mulching a strawberry planting.

    Mulching a strawberry planting helps avoid damage to roots from alternate freezing and thawing of the soil and may prevent excessive drying of the plants.

11. Why are flower trusses removed from newly-set strawberries the first year they are planted?

    Removing flower trusses from newly-set strawberry plants during the first year they are planted promotes the formation of runners for a better established planting.

12. What is the accepted practice for strawberry frost protection?

    The accepted practice in strawberry frost protection is to turn on the water when temperatures drop to 34°F at plant level in the field, run it continuously, and turn it off only when all the ice on the plant has melted.

13. When are bramble fruits ready for harvesting and what is the best time of day to pick them?

    Bramble fruits are ready for harvesting when sweet and firm. They should be picked in the early morning.

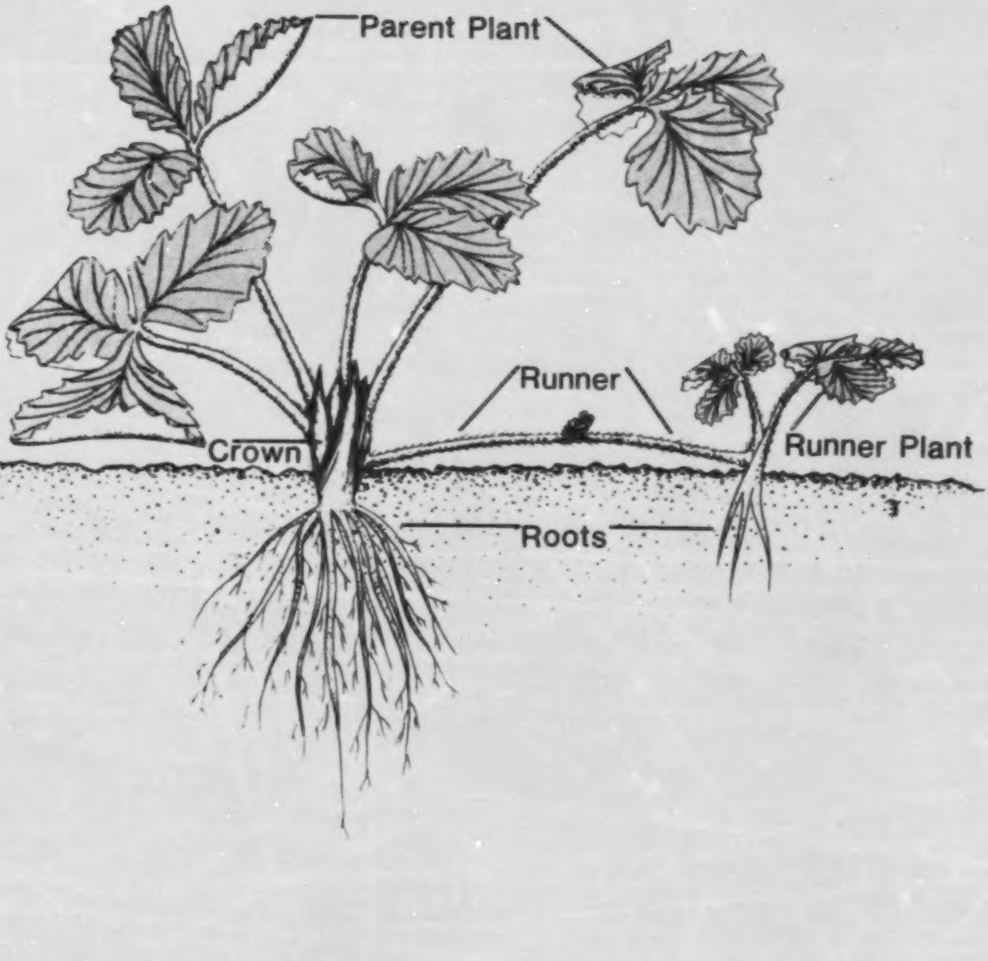
14. When are strawberries ready for harvesting and what is the best time of day to pick them?

    Strawberries are ready for harvesting when they are approximately three-fourths red. They should be picked in early morning when the berries are still cool.

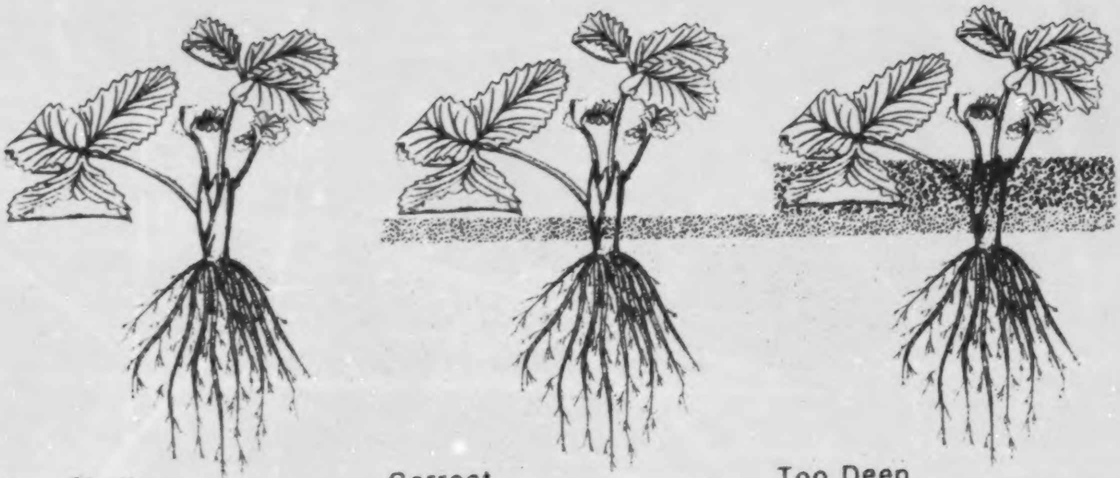
15. Why should the caps be left on when picking strawberries?

    The caps should be left on when picking strawberries to prevent the fruit from shrivelling.

Parts of the Strawberry Plant


Parent Plant
Runner
Crown
Runner Plant
Roots

Planting Strawberries Correctly



Too Shallow

Correct

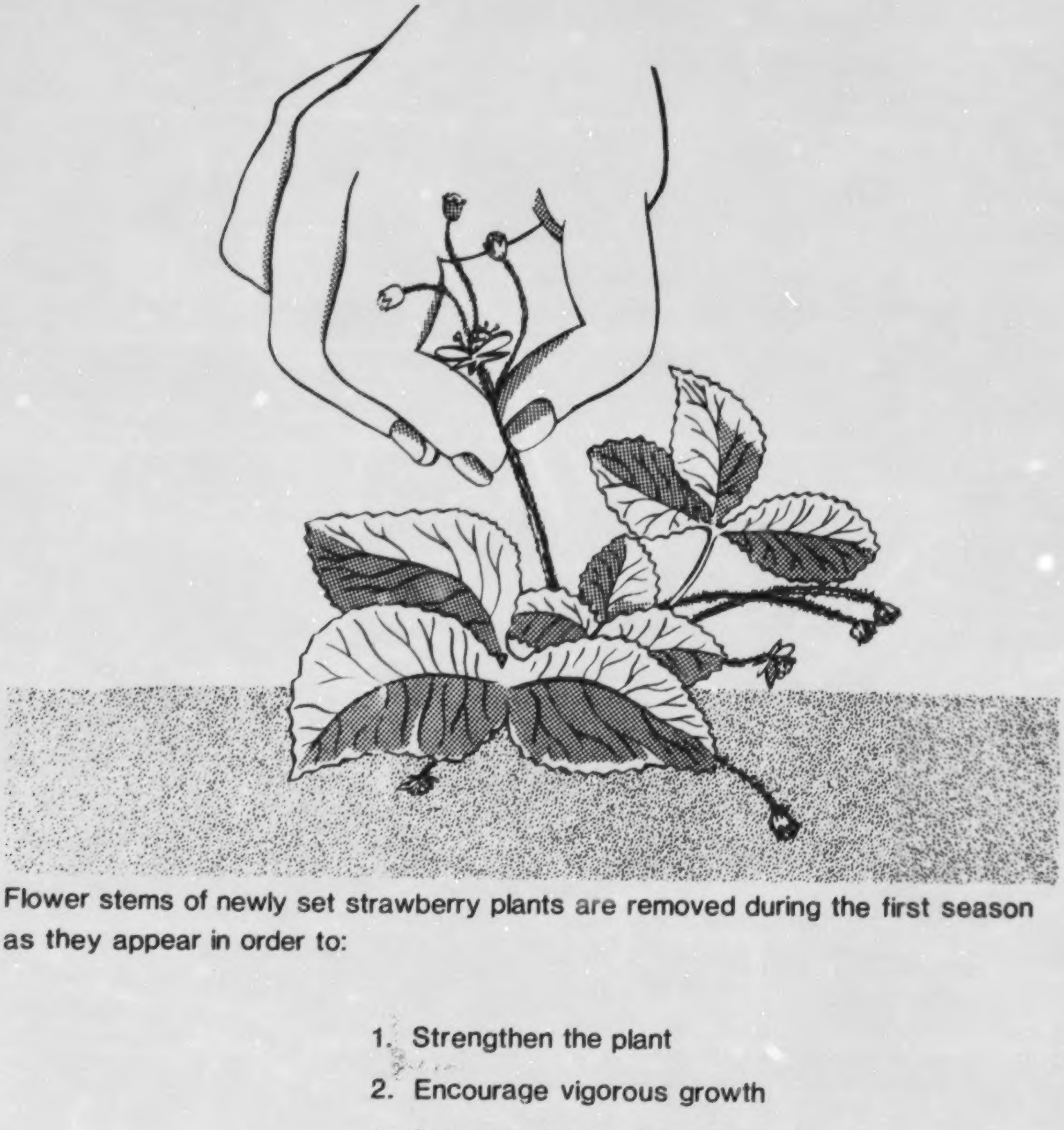
Too Deep

Crown of plant set too shallow.

Plant set so crown is even with ground surface after the soil has been firmed around the roots.

Crown of plant set too deep.

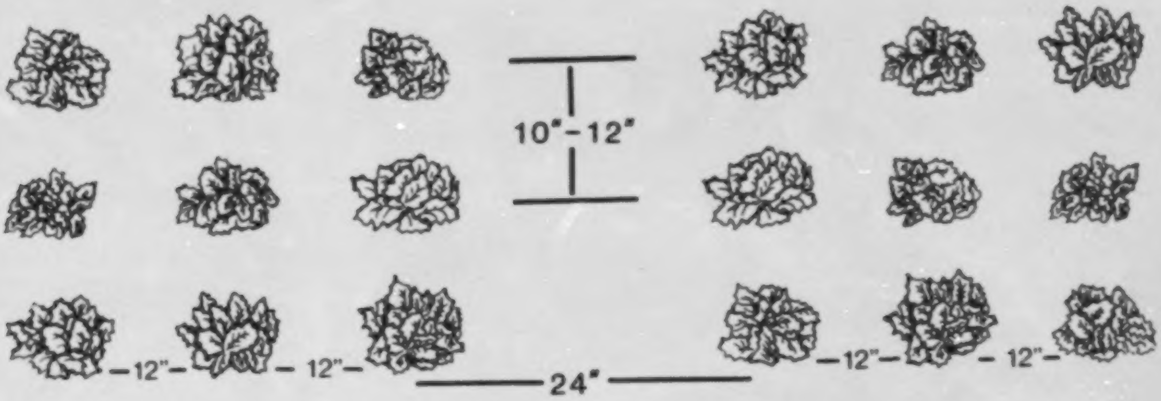
Removing Strawberry Plant Flowers



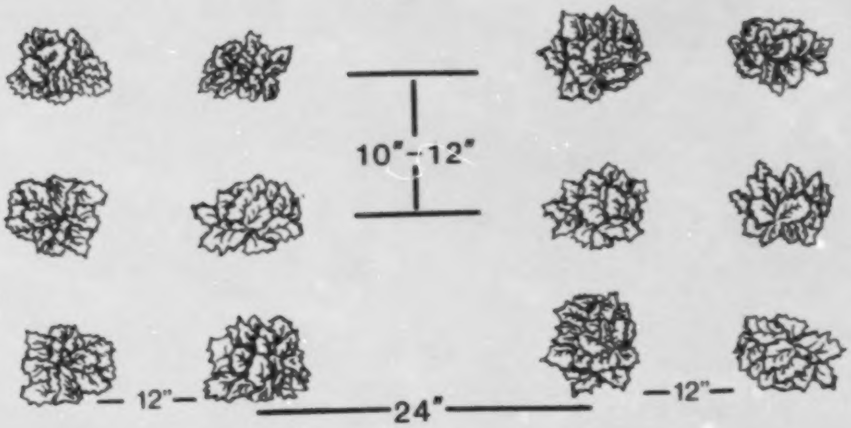
Flower stems of newly set strawberry plants are removed during the first season as they appear in order to:

1. Strengthen the plant
2. Encourage vigorous growth
3. Increase the number of runner plants which produce the most fruit the following year

The Hill System For Training Strawberries


10"-12"
12"
12"
24"
12"
12"

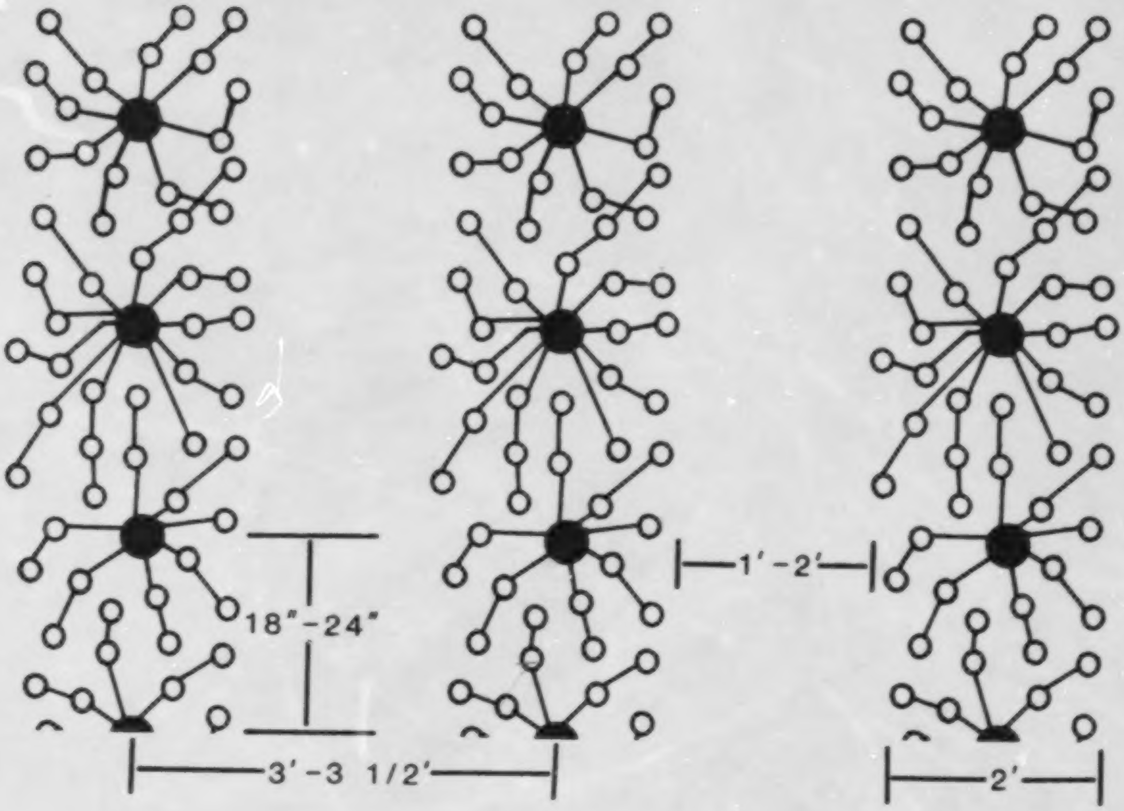
Triple Row Hill System


10"-12"
12"
24"
12"

Double Row Hill System

Plants are spaced 12 in. apart in double or triple rows. A 24 in. aisle is left between each group of rows. Runner plants are removed as they appear.

The Spaced Matted-Row System For Training Strawberries

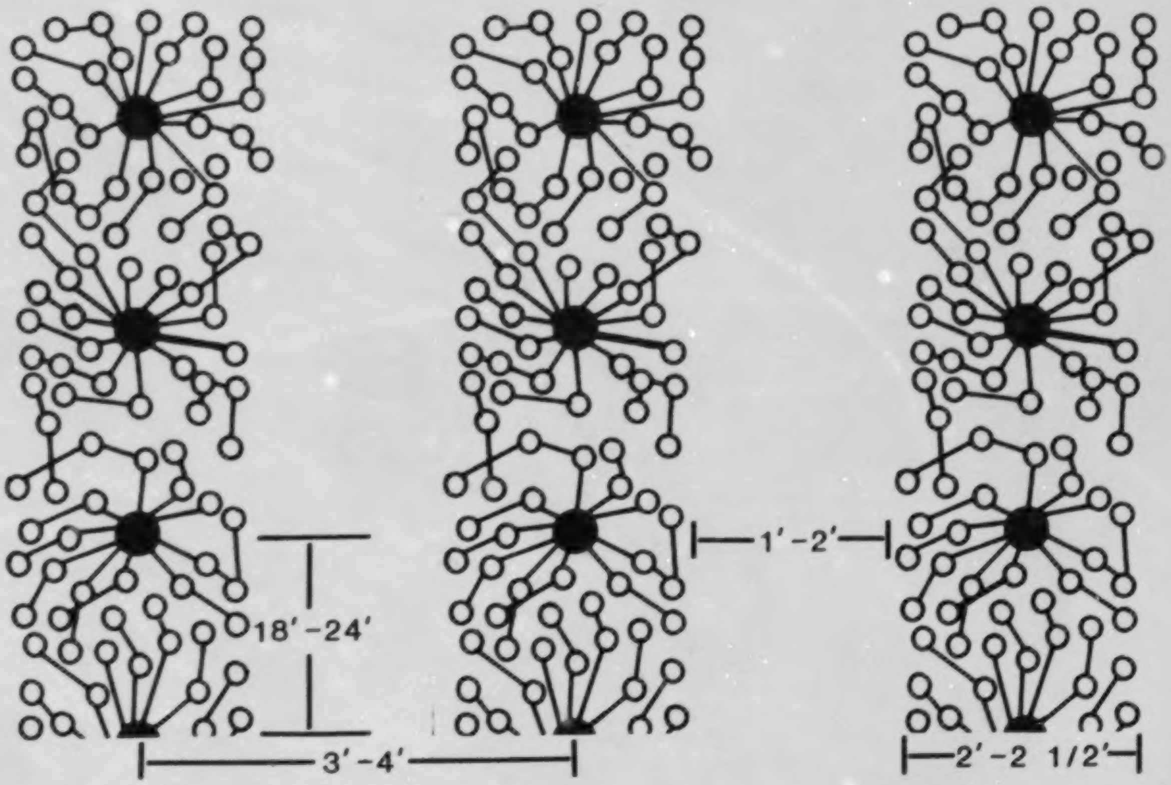


● Parent Plant

○ Runner Plant

Plants are spaced 18-24 in. apart in single rows. A 3-3 1/2 ft. aisle is left between each row. Runner plants are arranged by hand at 6 in. intervals until desired spacing is obtained. Final rows are 2 ft. wide.

The Matted-Row System for Training Strawberries



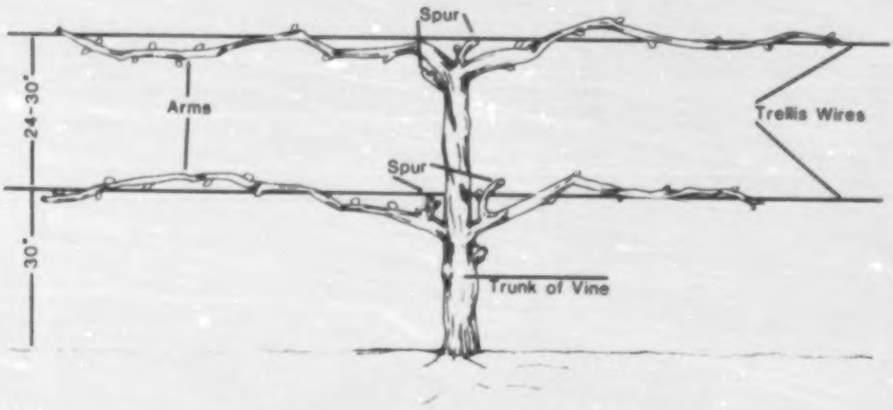
● Parent Plant

○ Runner Plant

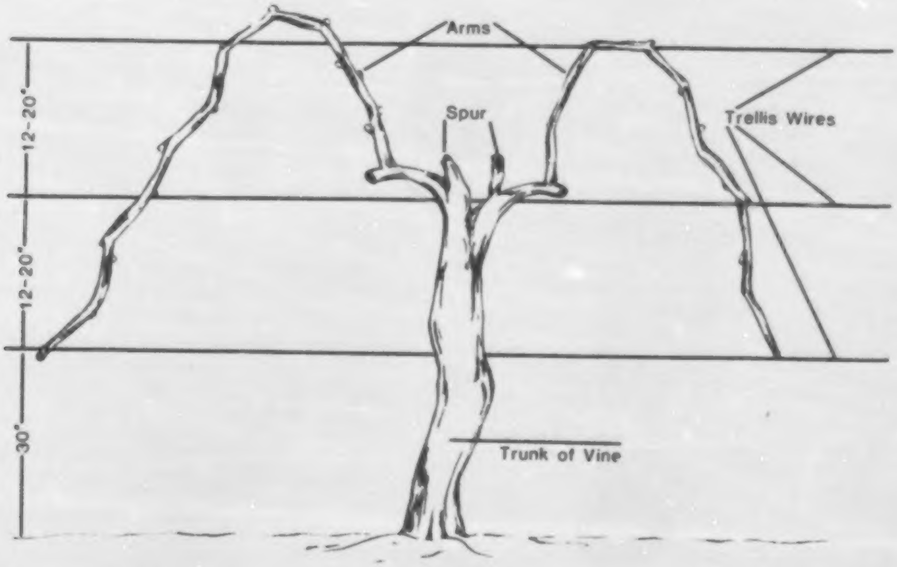
Plants are spaced 18–30 in. apart in single rows. A 3–4 ft. aisle is left between each row. Runner plants are allowed to grow naturally until a 2 ft. wide row is obtained.

Grapevine Training System

Four-Arm Kniffin Training System

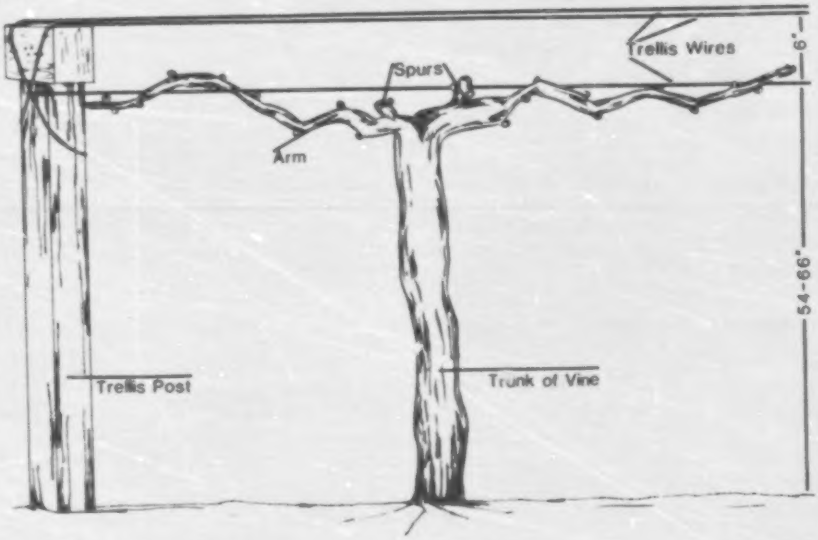

Spur
Arms
24-30"
Trellis Wires
Spur
30"
Trunk of Vine

Umbrella Kniffin Training System

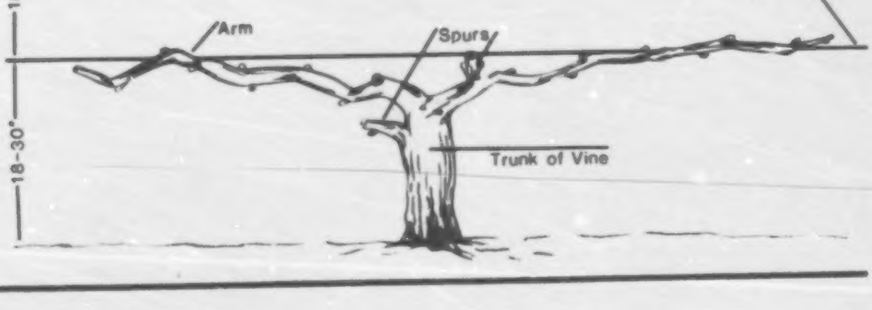

Arms
12-20"
Spur
Trellis Wires
12-20"
30"
Trunk of Vine

Grapevine Training Systems

Munson System

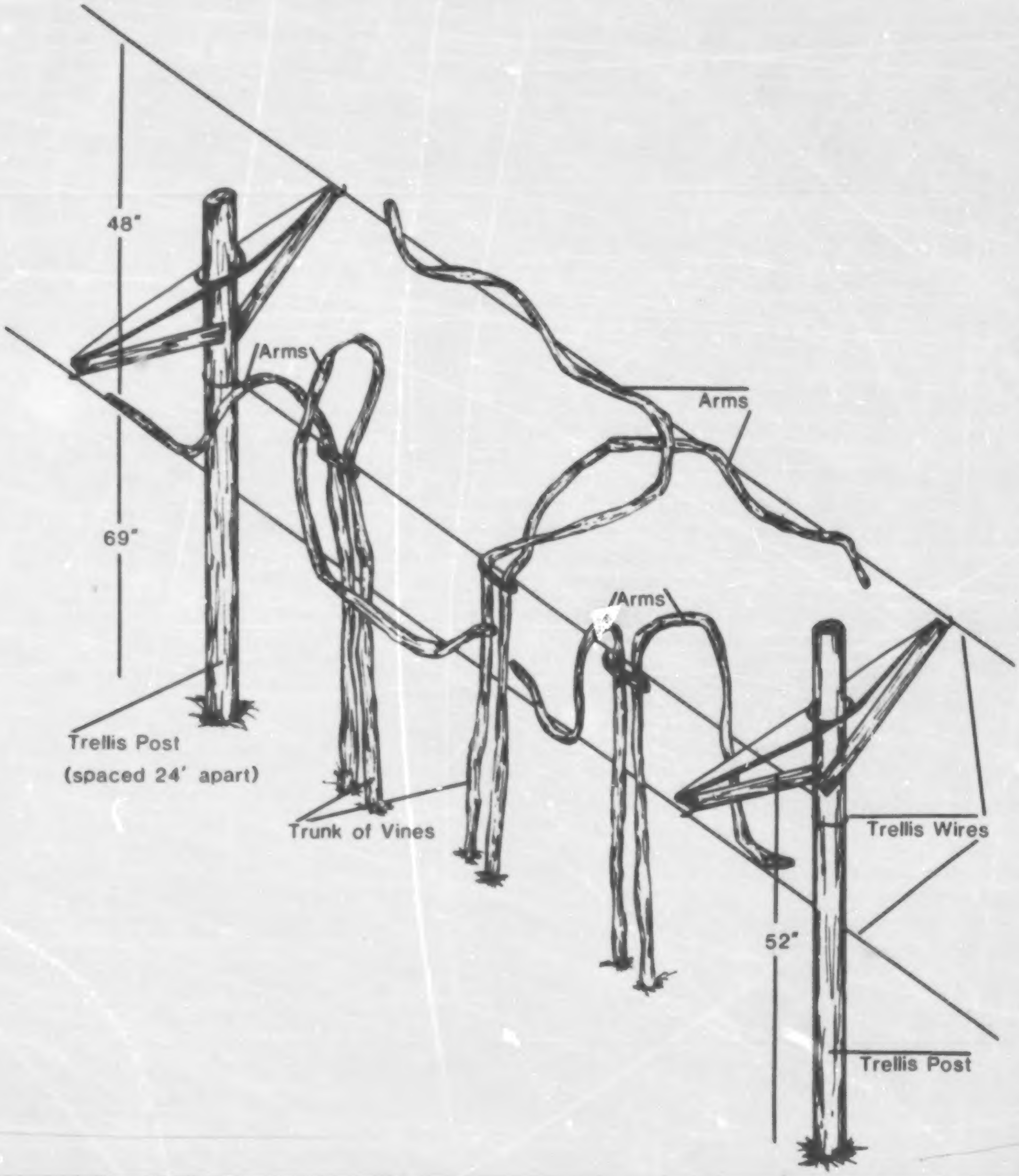

Trellis Wires
6"
Spurs
Arm
54-66"
Trellis Post
Trunk of Vine

Keuka High Renewal Training System

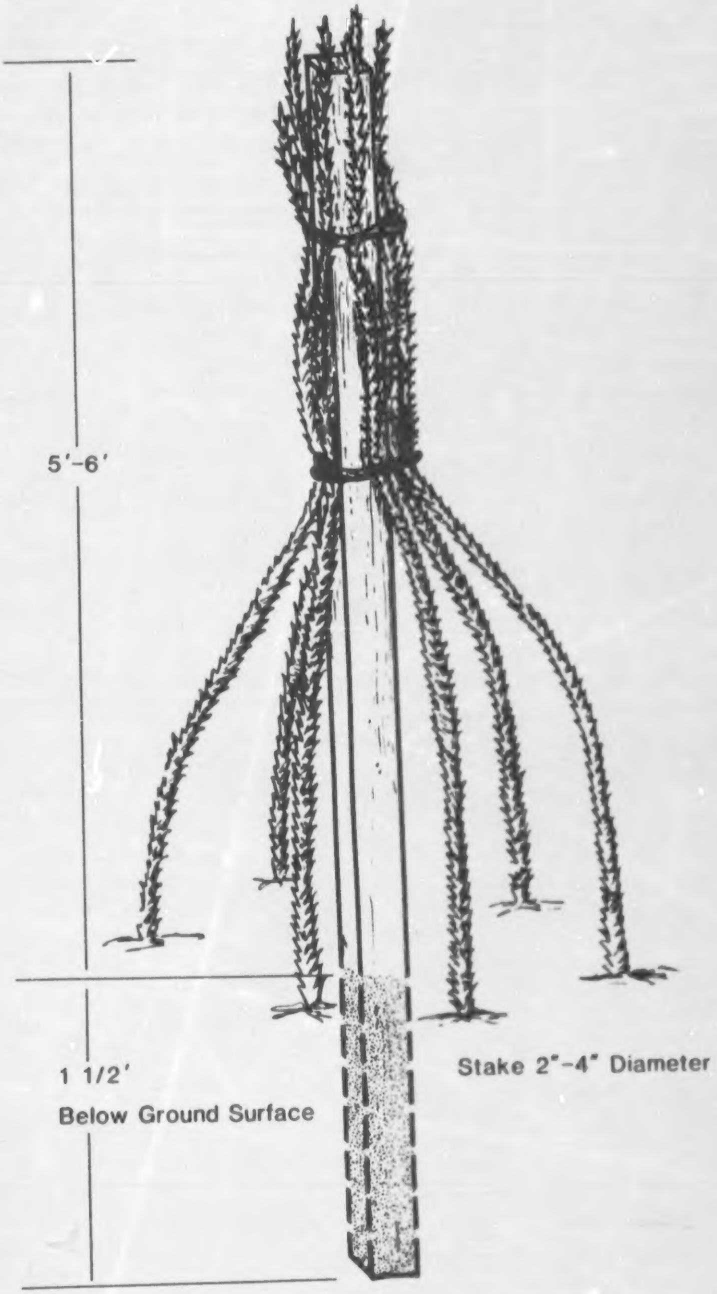

18-24"
Trellis Wires
18-24"
Arm
Spurs
18-30"
Trunk of Vine

Grapevine Training System

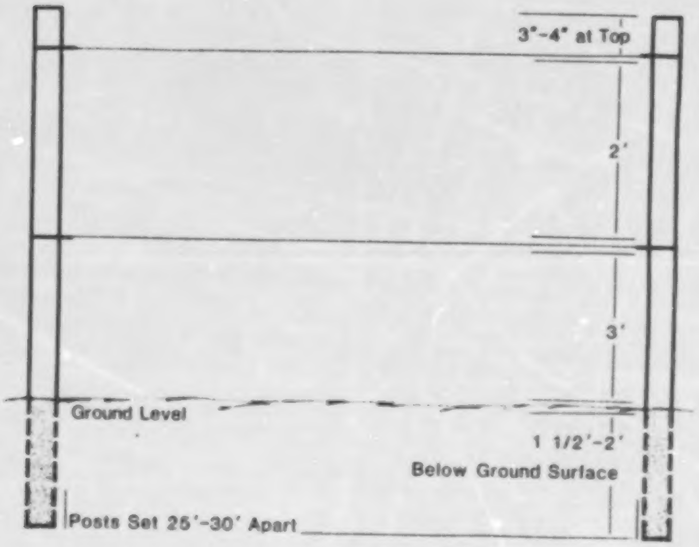
Geneva Double Curtain System


48"
69"
Arms
Arms
Arms
Trellis Post
(spaced 24' apart)
Trunk of Vines
Trellis Wires
52"
Trellis Post

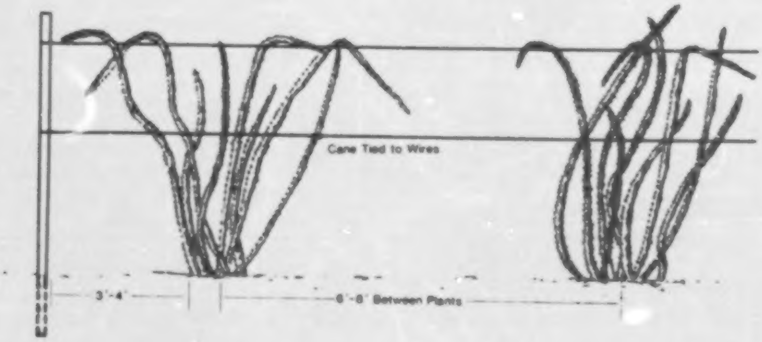
The Hill System For Training Brambles


5'-6'
1 1/2'
Below Ground Surface
Stake 2"-4" Diameter

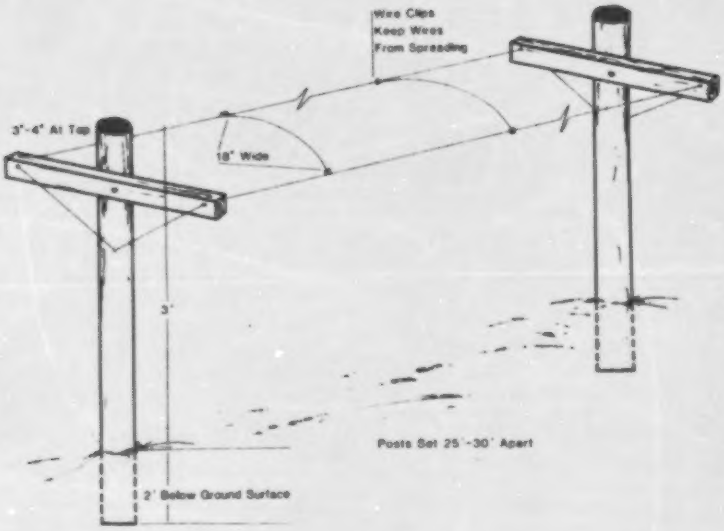
Vertical Type Wire System For Training Brambles


3"-4" at Top
2'
3'
Ground Level
1 1/2'-2'
Below Ground Surface
Posts Set 25'-30' Apart

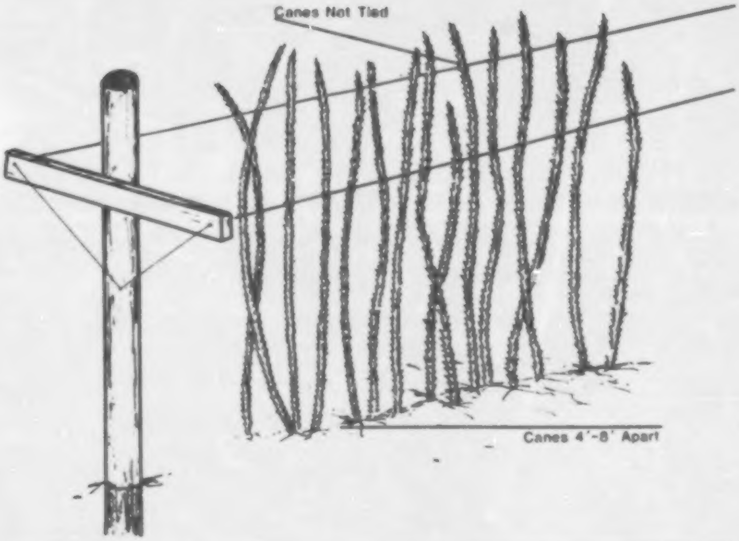
Trailing Blackberries on Vertical Trellis


Cane Tied to Wires
3'-4'
6'-8' Between Plants

Horizontal Type Wire System For Training Brambles

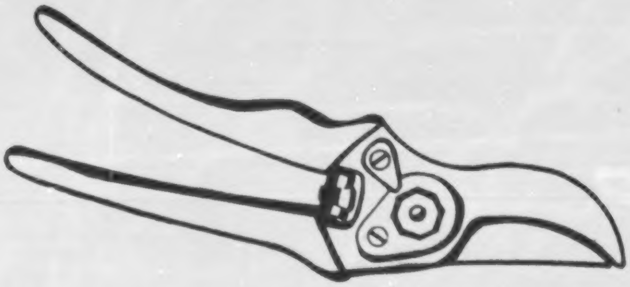

Wire Clips
Keep Wires
From Spreading
3"-4" At Top
18" Wide
3'
Posts Set 25'-30' Apart
2' Below Ground Surface

Red Raspberries on Horizontal Trellis

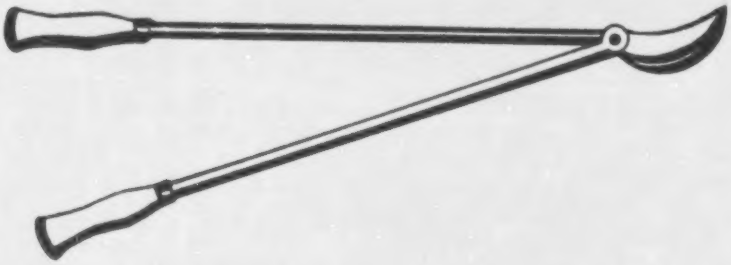

Canes Not Tied
Canes 4'-8' Apart

Tools Used For Pruning Brambles

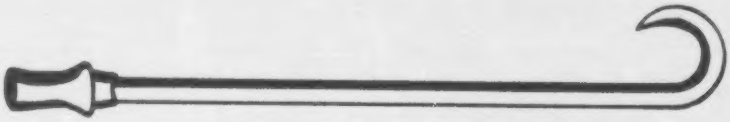
Hand Pruning Shears



Long Handled or Lopping Shears

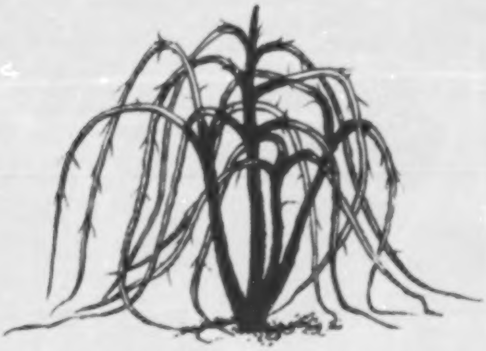


Bramble Hook

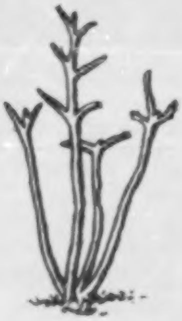


Pruning Raspberries

Black and Purple Raspberry

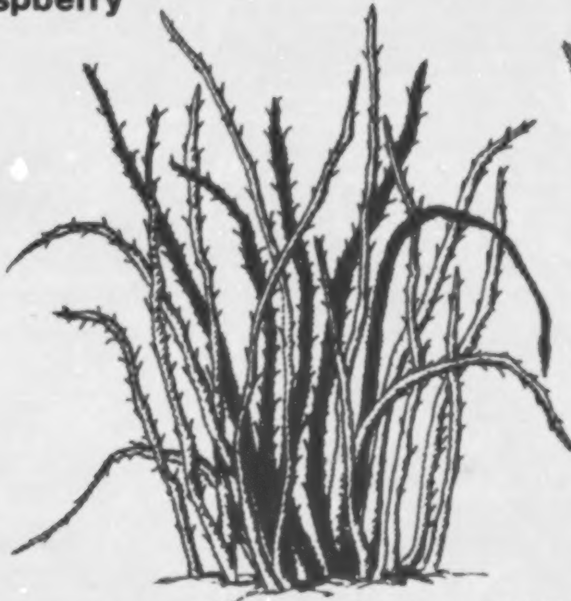


Before Pruning (shaded areas show part of plant that remains after pruning)

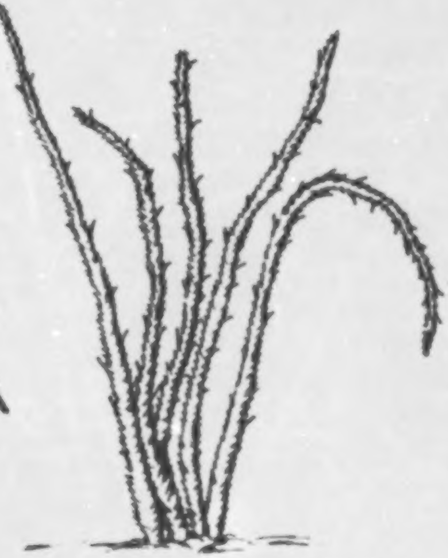


After Pruning

Red Raspberry



Before Thinning and Pruning (shaded areas show part of plant that remains after thinning and pruning)



After Thinning and Pruning

TRANSPARENCY DISCUSSION GUIDE

GROWING SMALL FRUITS AND BRAMBLES

I. Transparency -- PARTS OF THE STRAWBERRY PLANT

   A. Identify each part of the strawberry plant. Discuss the importance of knowing these parts when planting, training and harvesting strawberries.

II. Transparency -- PLANTING STRAWBERRIES CORRECTLY

   A. Planting strawberries the proper depth is critical. The crown should be set so it is even with the soil surface after the soil has been firmed around the roots.

   B. If the plant is set too deep crown rot can occur. If the plant is set too shallow the roots may dry out.

III. Transparency -- REMOVING STRAWBERRY PLANT FLOWERS

   A. Removing the flowers of newly set strawberry plants increases the number of runner plants which bear the most fruit the following year.

IV. Transparency -- THE HILL SYSTEM FOR TRAINING STRAWBERRIES

   A. No runners are allowed to grow

   B. Recommended for use with irrigation and intensive cultivation

   C. Not recommended if danger of white grubs, drought, or severe winters

   D. Most often system used in home garden

V. Transparency -- SPACED MATTED ROW SYSTEM FOR TRAINING STRAWBERRIES

   A. Runners allowed to grow are arranged by hand at 6 inch intervals until desired spacing is obtained.

   B. Final rows are two feet wide.

   C. Recommended for use with irrigation and moderate cultivation

VI. Transparency -- MATTED ROW SYSTEM FOR TRAINING STRAWBERRIES

   A. Runners allowed to grow until desired row width is obtained, then additional runners are removed. Rows are normally 2 feet wide.

B. Used where danger from severe drought, winters and white grubs exist

C. Smaller yields and fruit size than with other systems due to crowding of individual plants

D. Production costs per acre less than with other systems due to less weed control, no runner placement

E. Better adapted to machine cultivation

F. Major system used by Illinois commercial strawberry producers

VII. Transparency -- GRAPEVINE TRAINING SYSTEMS

A. FOUR-ARM KNIFFIN

1. most popular system for bunch grapes

2. trellis consists of 2 wires

3. requires little summer tying

B. UMBRELLA KNIFFIN

1. trellis consists of 2 or 3 wires

2. provides good yield and excellent quality fruit

C. MUNSON SYSTEM

1. used mostly in home plantings, very little in commercial plantings

2. trellis consists of 3 wires strung in the shape of a V

3. suitable for humid climates

D. KEUKA HIGH SYSTEM

1. suitable to varieties which produce upright shoots

2. not suitable for varieties with a drooping growth habit or requiring long cane pruning

3. should not be pruned to short canes

E. GENEVA DOUBLE CURTAIN

1. developed for vigorous vines

2. shoots and leaves receive more exposure to the sun

3. trellis space per vine is double that of other systems

4. used in areas of high humidity and low light intensity

5. positioning of shoots away from trellis posts allows for mechanical harvesting

VIII. Transparency --THE HILL SYSTEM FOR TRAINING BRAMBLES

A. Single stake 2-4" diameter used for support

B. 5-8 fruiting canes tied to the stake in one or two places after pruning

C. Plants usually set 6 feet apart

D. Little hand hoeing needed, fruit easy to pick

E. Most useful for home garden

IV. Transparency -- VERTICAL TYPE WIRE SYSTEM FOR TRAINING BRAMBLES

A. Used with linear system

B. Allows better weed, disease and insect control

C. Plants maintained in narrow row

D. Canes tied to wires

E. Most useful with red or yellow raspberries and trailing blackberries

X. Transparency -- HORIZONTAL TYPE WIRE SYSTEM FOR TRAINING BRAMBLES

A. Used with hedgerow system (most common training system)

B. End posts are braced or anchored

C. Wire clips are used to prevent canes from spreading trellis wire apart

D. Plants form a solid row approximately 18 inches wide

E. No tying of canes

XI. Transparency -- TOOLS USED FOR PRUNING BRAMBLES

A. Hand Pruning Shears - used to cut back lateral growth and terminal shoots (summer topping)

B. Lopping Shears - used to remove entire canes at ground level in thinning or removing fruited canes

C. Bramble Hook - serves same purpose as lopping shears; must be careful not to pull cane out of the crown when using the hook

XII. Transparency -- PRUNING RASPBERRIES

A. Red Raspberry

1. Pruned twiced yearly - in early spring and after fruiting in fall

2. Spring pruning - leave canes largest in diameter and length, 5-8 canes per stake in hill system, 4-8 inches apart in other systems; canes left should be headed back 5-6 feet or 3-4 feet if no support is provided

3. New shoots of red and yellow raspberries should NOT be summer topped.

4. Pruning after fruiting - remove fruited canes any time after harvest, burn the removed canes

5. Everbearing varieties are pruned the same as single crop varieties. However, shoots that fruit in the fall should NOT be removed after the fall harvest. These shoots will bear fruit the next spring.

B. Black and Purple Raspberry

1. Pruned three times yearly - in early spring, during summer, and after fruiting

2. Early spring dormant pruning - remove all but 4 to 5 of most vigorous canes per plant; lateral branches are shortened to 8-10 inches of growth or 8-12 buds per lateral; weak (¼ inch diameter or less) or dead laterals removed

3. Summer pruning - new shoots are pinched back 3-4 inches from growing tip; this is done at weekly intervals as canes reach proper height for topping (24 inches high for black raspberries, 30-36 inches high for purple raspberries and erect blackberries)

4. Pruning after fruiting - remove fruited canes any time after harvest; burn the removed canes

SAMPLE TEST QUESTIONS AND TEACHER'S KEY

GROWING SMALL FRUITS AND BRAMBLES

MULTIPLE CHOICE:

B 1. The most popular training system for bunch grapes is

a. trellis
b. 4-arm kniffen
c. Keuka high
d. Geneva double curtain

C 2. When planting strawberries the crown should be set

a. completely above the ground
b. completely below the ground
c. so that 1/3 of it is buried and it is even with the ground surface after the soil has been firmed around the roots
d. none of the above

D 3. The matted row system for training strawberries is the major system used by Illinois commercial strawberry producers because

a. it is better adapted to machine cultivation
b. less weed control is needed
c. there is no runner placement so fruit size and yields may be smaller
d. all of the above

C 4. The three major training systems for growing brambles are the

a. 4-arm kniffen, munson, and umbrella kniffen
b. hill, spaced matted row, and vertical trellis
c. staked hill, vertical wire trellis and horizontal wire trellis
d. staked hill, horizontal trellis and umbrella trellis

B 5. The vertical-type wire trellis system for growing brambles

a. requires no tying of canes
b. allows better weed, disease and insect control
c. is the most useful for home garden plots
d. utilize wire clips to prevent bramble canes from spreading the trellis wires apart

TRUE OR FALSE:

True 1. Grapes may be trained on an arbor, a trellis, fence or other suitable structure.

True 2. The soil pH for strawberries should be 5.5 - 6.5 for optimum production.

True 3. The first-year blossoms should be removed off of newly-set strawberry plants.

True 4. Irrigation can be used for frost control of strawberries in early spring.

False 5. Strawberry patches do not need to be renovated to improve fruit production.

True 6. Blueberries need a pH of 4.8 - 5.2 for optimum growth.

False 7. Blackberries and raspberries can be interplanted.

True 8. Pruning tools should be cleaned and their cutting surfaces wiped with an oily cloth after each use.

False 9. The staked hill training system is the most practical for large scale plantings of brambles.

False 10. Brambles should be planted on sites where solenaceous crops (potatoes, tomatoes, tobacco) have been grown because these crops rid the soil of insects and disease affecting brambles.

SHORT ANSWER:

1. What is the difference between blackberries and raspberries and what is the term that refers to both plants?

   Blackberries and raspberries are known as brambles. Plants with ripe fruit that slips easily from the receptacle are known as raspberries. Plants with ripe fruit that does not slip easily from the receptacle are known as blackberries.

2. Name 3 major factors to consider when selecting a site to grow brambles

   1. soil type

   2. air circulation

   3. previous crop history

3. Why is irrigation important for a small fruit planting?

   Small fruits have shallow root systems and require large quantities of water (1-1½ inches per week). Irrigation is essential for producing larger, high quality fruit. In some cases, such as with strawberries, irrigation can be used as a method of frost protection.

4. Name 4 factors to consider when selecting which small fruit varieties to plant?

   1. adaptability to regional conditions

2. season of maturation

3. disease resistance

4. fruit size and yield

5. When is the best time of day for harvesting small fruits?

The best time of day for harvesting small fruits is in the early morning after the dew has evaporated and when the fruit is still cool.

UNIT G: GROWING HORTICULTURAL CROPS

PROBLEM AREA: GROWING TREE FRUITS

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with eleventh grade or advanced students in a horticultural or agricultural occupations program. The recommended time for teaching this problem area is during the fall of the year.

The estimated instructional time for this problem area is 6-8 days, depending on how far the teacher wishes to go in developing skills on growing tree fruits. If the teaching plan is limited to classroom discussion with little or no practice or observation, the instructional time can be five days or less. If the students are to be involved in other activities, the instructional time will need to be increased.

The materials and information available for studying tree fruits grown in Illinois are vast. Therefore, the list of references and aids in the back of this problem area is lengthier than most. In addition, the instructor is encouraged to conduct a local search to locate other supplementary materials. Instructors should examine all materials in terms of their local situation and modify the materials as necessary.

Before teaching this unit instructors should review the Cooperative Extension Circulars mentioned in the Reference and Aids section. These circulars provide information regarding fruit tree varieties suitable for Illinois, fertilization procedures, pollination, maintenance schedules, et cetera. Although this unit emphasizes apples, the publications discuss a variety of tree fruits. When planning daily lessons, instructors should emphasize those tree fruits which are predominant in their local area.

CREDIT SOURCES:

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The teacher's guide, information sheet, student worksheets and sample test questions were developed by Marcia Watman-Lauchner, Department of Vocational and Technical Education. Transparency masters were prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Metropolitan Core Curriculum Field Test Teachers.

TEACHERS' GUIDE

I. Unit: Growing horticultural crops

II. Problem area: Growing tree fruits

III. Objectives: At the close of this problem area students will be able to:

1. Select and prepare a site for growing tree fruits.
2. Plant and properly space fruit trees for sufficient pollination.
3. Incorporate fruit trees into the home landscape.
4. Identify insects, pests, weeds, and diseases affecting tree fruits.
5. Maintain a year round insect, pest, weed and disease prevention/control schedule for fruit trees.
6. Maintain a fertilization schedule for fruit trees.
7. Prune fruit trees properly.
8. Harvest fruit.

IV. Suggested interest approaches:

1. Bring in several varieties of apples, peaches and/or other tree fruits and have students taste the different varieties.
2. Ask the students if they have any fruit trees in their home landscape. If so, ask them to tell the class about the variety and maintenance practices they are using.
3. Bring in several varieties of apples of different sizes and colors. Ask the students why there are so many different varieties, what makes each variety different, and how would they decide which variety to plant.

V. Anticipated problems and concerns of students:

1. How do I decide where to plant tree fruits?
2. How should I prepare the site I selected for growing tree fruits?
3. How do I find out which varieties of each type of fruit are best suited to my geographical area?
4. What is the difference between semi-dwarf, dwarf, and standard?
5. What are the advantages and disadvantages of growing fruit trees from seed?

6. How do I transplant fruit trees that are balled and burlapped or container grown?

7. How far apart should I plant my fruit trees?

8. Do I need beehives around my fruit trees for pollination?

9. How many years must I wait for different fruit trees to bear fruit?

10. What do I use and how often do I fertilize fruit trees?

11. Do fruit trees need mulches?

12. What happens if I damage the trunk while trimming grass around the tree with a lawn mower?

13. How do I prune and train fruit trees to increase fruit production?

14. What type of animal damage occurs on fruit trees and how can it be prevented?

15. What insects and diseases are found on fruit trees?

16. When do you spray fruit trees for insects and diseases?

17. How are tree fruits harvested?

VI. Suggested learning activities and experiences:

1. Conduct a brainstorming session with students on the factors to consider when selecting and preparing a site for growing tree fruits. Assign each student a factor to research. For example, if previous land use is a factor to consider have a student research how certain previously grown crops have an effect on the planting of tree fruits.

2. Have students plan for the establishment of fruit trees on the school grounds. Information and prices can be obtained from a local nursery. Students should be cautious for hardy zone and maintenance requirements.

3. Determine the number of apple trees needed to plant an acre lot. Have students calculate the production costs of establishing a one acre fruit orchard. Include costs such as trees, fertilizer, mulching, and spraying.

4. Have students read Cooperative Extension Circular 998 - Tree Fruit and Nut Varieties For Illinois Home Orchards. Have students discuss and compare the differences between what is recommended and what is actually available from catalogs or local garden centers.

5. Have students contact the local county Cooperative Extension Service office and report back to the class on a particular type of fruit tree that is recommended for use in their geographical area and blends in well with their home landscape.

6. Take a field trip to a fruit tree orchard and have the grower speak to students on various aspects of fruit production and management, and the possibilities of future employment in such an area. If the class cannot visit an orchard have a commercial grower visit and discuss these topics in class.

7. Demonstrate the proper practices of planting, wrapping, training, fertilizing and controlling pests on fruit trees.

8. Have a resource person from the Cooperative Extension Service talk on home maintenance of fruit trees.

9. Demonstrate the proper tools and pruning techniques used with fruit trees. This can be done with the audio-visuals selected for this problem area if an on-site demonstration is not possible.

10. After reading VAS Subject Matter Unit 4043, have students complete Student Worksheet I-Pruning Fruit Trees. Review the concepts with them once they have finished.

11. Show VAS Fruit Disease Sheets I and II on Apples. Discuss the prevention/controls available for these and other diseases. Have some of the chemicals available and demonstrate how to apply them. A follow-up discussion could include insect, weed, and animal pest prevention/controls. When discussing or demonstrating the use of chemicals, safety precautions should always be stressed.

12. Have students read Cooperative Extension Circular 1144 - Controlling Weeds in Home and Fruit Plantings, pages 3-6. Lead a discussion following this reading. Have students visit a local garden center, inquire about the most up-to-date weed control treatments, and report back to class on their findings. Each student could write a short report on one control/herbicide and discuss it with the class.

13. Have students discuss the information in the Cooperative Extension Circular 1145 - Home Fruit Pest Control. Particular attention should be focused on the safety factors involved when controlling pests with chemicals

14. Have students make a chart, either for themselves or for the classroom, of apple trees and their pollinating varieties. Other tree fruits can be used in this exercise. Students will need to check the tree grower's catalogs for this information as specific varieties vary from one grower to another.

15. Bring in tree fruits at various stages of ripeness. Have students taste the fruit. Ask students how one would determine the proper time to harvest fruits.

16. Students really interested in the topic who have or plan to have apple or peach trees at home, should read Cooperative Extension Circular 1122 - Illinois Fruit Calendar. Make sure they read page 4 for instructions on how to properly use the calendar. If apple and/or peach trees are to be planted on the school grounds, each student should become familiar with the Illinois Fruit Calendar and be responsible in some way for the success of the tree(s).

17. Discuss with students how to use the Fruit and Vegetable Production Record Book or My Plant Diary for their SOEP's. Both publications are available from Vocational Agriculture Service.

18. Take the students on a field trip to a nearby tree fruit pick-your-own operation. Refer to the most updated version of the (1982) Directory of Pick-Your-Own Fruits and Vegetables in Illinois. The full address for receiving this directory is in the Reference and Aids section.

19. Use the competency inventory to discuss entry level requirements for work in the tree fruits area. Have students complete the Competency Inventory at the end of the unit, so they can assess their progress.

VII. Application procedures:

1. The information and materials in this problem area can be used by the student who has an S.O.E. program concerning tree fruits.
2. Students can apply knowledge learned as an employee in a nursery, orchard or local garden center.
3. The material in this problem area can be applied by the student for present or future home landscaping.

VIII. Evaluation:

1. Administer and evaluate worksheets completed by students.
2. Prepare, administer and grade a written test using the sample test questions enclosed in this problem area.
3. If feasible, evaluate students on the actual pruning of fruit trees.
4. Check student progress through use of the Competency Inventory.

IX. References and aids:

1. Vocational Agriculture Service, University of Illinois, 1401 S. Maryland Drive, Urbana, IL 61801

   A. Subject Matter Unit 4043 - Pruning Fruit Trees
   B. Tree Fruit - Apple Disease Sheets I, II
   C. Fruit and Vegetable Production Record Book
   D. My Plant Diary

2. Cooperative Extension Service, College of Agriculture, University of Illinois, Urbana, IL 61801

   A. Circular 1013 - Growing Tree Fruits in the Home Garden
   B. Circular 1122 - Illinois Fruit Calendar
   C. Circular 998 - Tree Fruit and Nut Varieties for Illinois Home Orchards
   D. Circular 1144 - Controlling Weeds in Home Fruit Plantings
   E. Circular 1145 - Home Fruit Pest Control
   F. Fruit and Vegetable Calendar (minimal cost)

3. All About Growing Fruits and Berries, Ortho Books, Chevron Chemical Company, Ortho Division, 575 Market Street, San Francisco, California, 94105

   This publication is available at most local garden centers and public libraries.

4. 1982 Directory of Pick-Your-Own Fruits and Vegetables in Illinois, Illinois Department of Agriculture, Division of Marketing, Agriculture Building, State Fairgrounds, Springfield, Illinois 62706 or contact your local Agricultural Extension Office.

COMPETENCY INVENTORY

GROWING TREE FRUITS

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

Competency	Circle One						
1. Prepare the soil for planting fruit trees.	1	2	3	4	5		
2. Prepare the site for planting the trees.	1	2	3	4	5		
3. Plant trees in orchard according to plan.	1	2	3	4	5		
4. Water newly planted trees.	1	2	3	4	5		
5. Prune newly planted trees.	1	2	3	4	5		
6. Prune trees to establish scaffold branches.	1	2	3	4	5		
7. Take soil samples.	1	2	3	4	5		
8. Apply fertilizer.	1	2	3	4	5		
9. Apply insecticides and fungicides to trees.	1	2	3	4	5		
10. Thin fruit by use of chemicals.	1	2	3	4	5		
11.							
12.							
13.							
14. Select appropriate varieties of trees.						6	7
15. Select good planting sites.						6	7
16. Select an appropriate system of training for each fruit.						6	7
17. Assure adequate pollination.						6	7
18. Determine optimum time to harvest fruit crop.						6	7
19. Determine most appropriate method of harvesting.						6	7
20. Identify outlets for fruit products to be marketed.						6	7

These are competencies outlined in the National Ag Occupations Competency Study for entry level positions in agricultural/horticultural production.

Name Date

INFORMATION SHEET I

SOURCES OF TREE FRUIT PLANTS

This is only an example of the many growers. Exclusion does not imply inferior plant material. Do not hesitate to check with your local nursery/ garden center first.

Bountiful Ridge Nursery
Princess Anne, MD 21853

Clyde Nursery
Clyde, OH 43410

Cumberland Valley Nursery
McMinnville, TN 37110

Emlong Nursery
Stevensville, MI 49127

Haley Nursery
Smithville, TN 37166

Hilltop Nursery
Hartford, MI 49057

Inter-State Nursery
Hamburg, IA 51640

Kelly Bros. Nursery
Dansville, NY 14437

Miller Nurseries
Canandaiqua, NY 14424

Neosho Nursery
Neosho, MO 64850

Stark Bros. Nursery
Louisiana, MO 63353

Steelman Nursery
Princeton, NJ 08540

Waynesboro Nursery
Waynesboro, VA 22980

STUDENT WORKSHEET I

TERMS ASSOCIATED WITH TREE FRUITS

INSTRUCTIONS: Find the definitions of each term by looking these words up in various references including the dictionary or horticultural textbooks covering tree fruits.

1. DWARF -
2. SEMI-DWARF -
3. GENETIC DWARF -
4. SPUR -
5. HARDINESS ZONE -
6. MALLING/MERTON MALLING ROOTSTOCK -
7. THINNING THE FRUIT -
8. HERBICIDE -
9. INSECTICIDE -
10. FUNGICIDE -
11. CROTCH ANGLE -
12. SCAFFOLD -
13. HAND PRUNING SHEARS -
14. LOPPING SHEARS -
15. PRUNING SAW -
16. POLE PRUNER -

STUDENT WORKSHEET 2

PRUNING FRUIT TREES

Reference - VAS Subject Matter Unit 4043 - Pruning Fruit Trees

1. What are the primary purposes of pruning fruit trees?

2. How does pruning increase the vigor of growth of a tree?

3. Why would pruning delay fruiting and lessen the yield of the tree?

4. What is a weak crotch angle? Draw a weak crotch angle.

STUDENT WORKSHEET 2 - continued

5. What is the most desirable angle between the branches of fruit trees?

6. Why is it better to prune out some large upper branches?

7. How does pruning affect fruit quality and condition?

8. Name 3 ways that pruning helps control diseases and insects?

9. When is the best time of the year to prune fruit trees? Explain your answer.

TEACHER'S KEY - STUDENT WORKSHEET 1

TERMS ASSOCIATED WITH TREE FRUITS

1. DWARF - Made up of two distinct tree parts. A dwarfing rootstock is used to limit the tree growth up to 50% of the standard size. This is done by horticulturalists.

2. SEMI-DWARF - The tree grows from 60-75% of the standard size. This is done by horticulturalists.

3. GENETIC DWARF - The genetic make-up of the tree is the limiting factor in growth. This is a natural event.

4. SPUR - Where the fruit grows on an apple tree.

5. HARDINESS ZONE - Refers to the cold hardiness of plant and tree varieties. Some varieties may not grow in certain hardy zones. Illinois has two zones.

6. MALLING/MERTON MALLING ROOTSTOCK - Dwarfing and semi-dwarfing rootstocks used in grafts to determine tree size. They are shorter than the standard tree.

7. THINNING THE FRUIT - Once the fruit crop is starting to grow; this is the removal of some fruits to allow for the best growth possible without crowding.

8. HERBICIDE - Chemical used in weed control.

9. INSECTICIDE - Chemical used in insect control.

10. FUNGICIDE - Chemical used in some disease control.

11. CROTCH ANGLE - The angle where branches fork or where a main limb joins the trunk. A strong crotch angle is an angle of 45 degrees or more.

12. SCAFFOLD - The main limbs branching from the trunk.

13. HAND PRUNING SHEARS - For pruning branches up to ½" in diameter.

14. LOPPING SHEARS - For pruning branches ½" to 1" in diameter.

15. PRUNING SAW - For pruning over 1" in diameter.

16. POLE PRUNER - For pruning up to 2" diameter wood, 12-16 feet above the ground.

TEACHER'S KEY - STUDENT WORKSHEET 2

PRUNING FRUIT TREES

Reference - VAS Subject-Matter Unit 4043 - Pruning Fruit Trees

1. What are the primary purposes of pruning fruit trees?

   Pruning fruit trees is done for the following reasons:

   A. To reduce total growth
   B. To increase vigor of growth
   C. To delay fruiting and lessen yield
   D. To avoid narrow angled branches and weak crotch angles
   E. To improve fruit quality and condition
   F. To aid in controlling diseases and insects.

2. How does pruning increase the vigor of growth of a tree?

   Pruning a tree causes the remaining branches to grow larger. The lateral branches will also develop faster and grow longer.

3. Why would pruning delay fruiting and lessen the yield of the tree?

   Any cultural practice which tends to maintain a vigorous shoot growth delays the formation of fruit buds. Pruning young trees either before or after they reach a fruit bearing stage also lowers fruit yields.

4. What is a weak crotch angle? Diagram a weak crotch angle.

   A limb that branches from the trunk at a narrow angle forms a weak crotch angle.

5. What is the most desirable angle between the branches of fruit trees?

   An angle of 40-60 degrees is the most desirable angle between the branches of fruit trees.

6. Why is it better to prune out some large upper branches?

   It is better to prune out large upper branches which shade out and decrease fruit yields on the lower branches.

7. How does pruning affect fruit quality and condition?

   Pruning can improve fruit quality and condition by letting in more light to give better color to the fruit. Pruning also removes limbs that may rub against fruit and damage it.

8. Name 3 ways that pruning helps control diseases and insect.

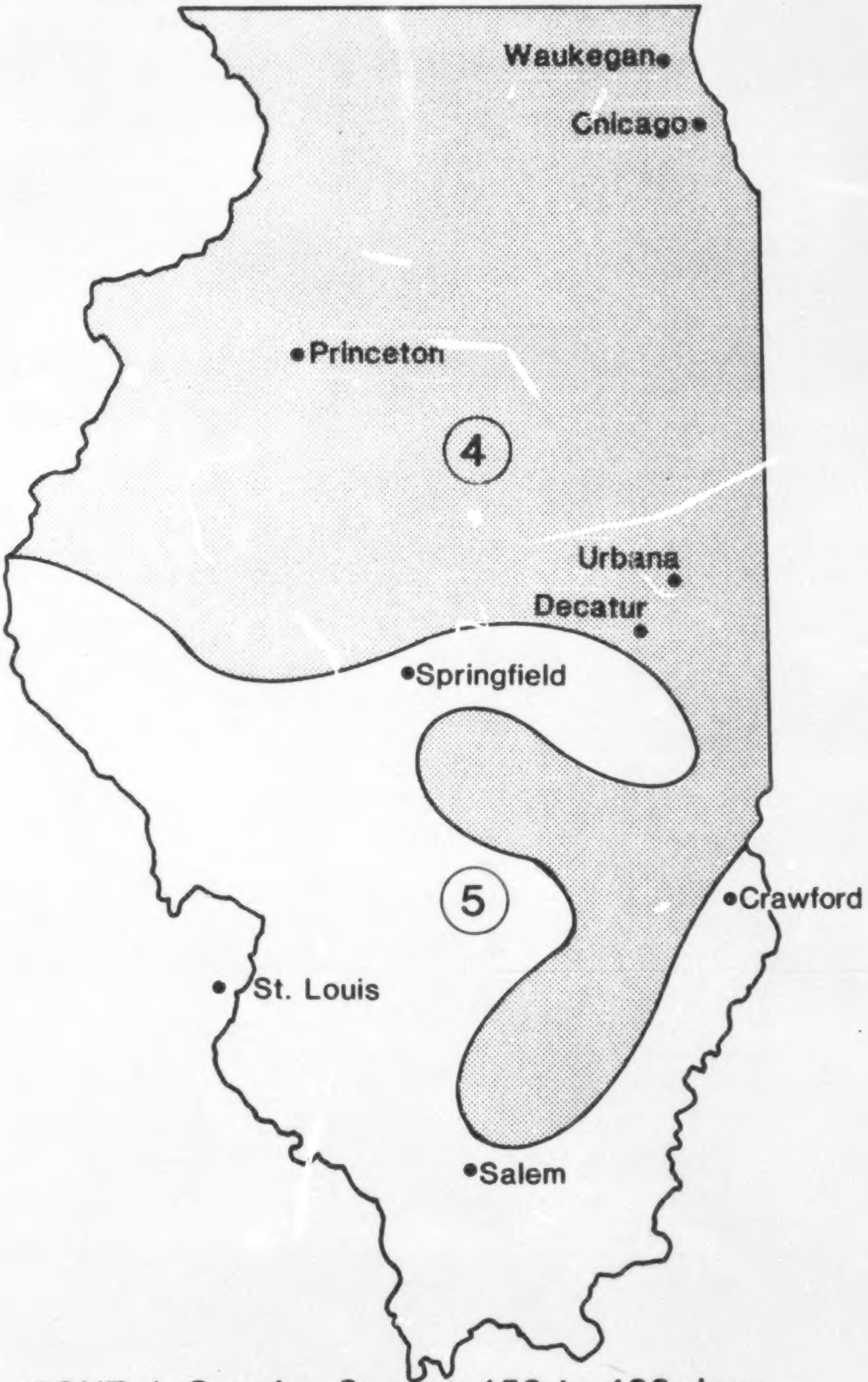
Pruning helps control diseases and insects by

1. allowing more complete coverage of the branches when spraying preventive pesticides
2. eliminating a haboring place for insects and disease in dead or dying wood
3. removing dead, weak and useless limbs, resulting in a stronger and more disease resistant tree.

9. When is the best time of year to prune fruit trees? Explain your answer.

Pruning should be done during the dormant season. The open wounds caused by pruning are less susceptible to insects and disease at this time, thus causing less stress to the tree. In addition, when the leaves have dropped, the proper pruning cuts can be easily and readily determined.

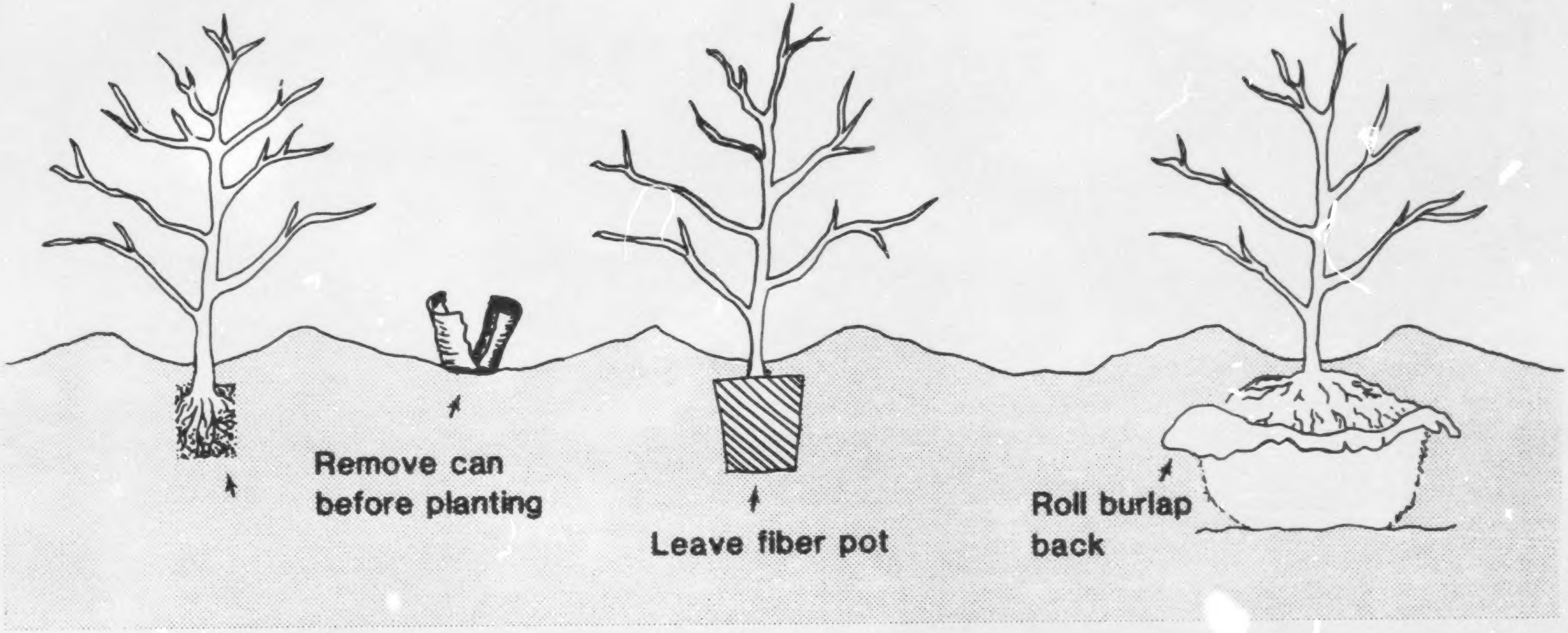
FRUIT CLIMATE ZONES FOR ILLINOIS


Waukegan
Chicago
Princeton
4
Urbana
Decatur
Springfield
5
Crawford
St. Louis
Salem

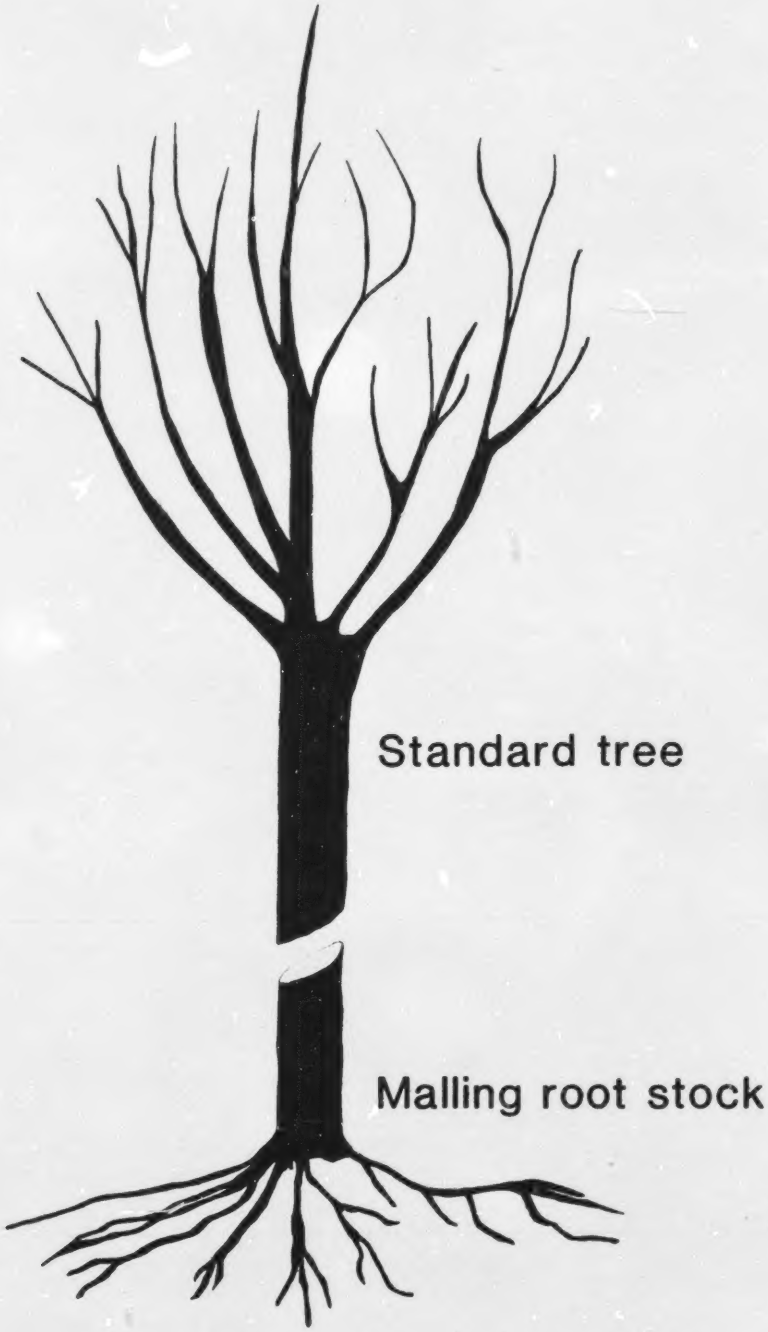
ZONE 4–Growing Season 150 to 180 days

ZONE 5–Growing Season 180 to 210 days

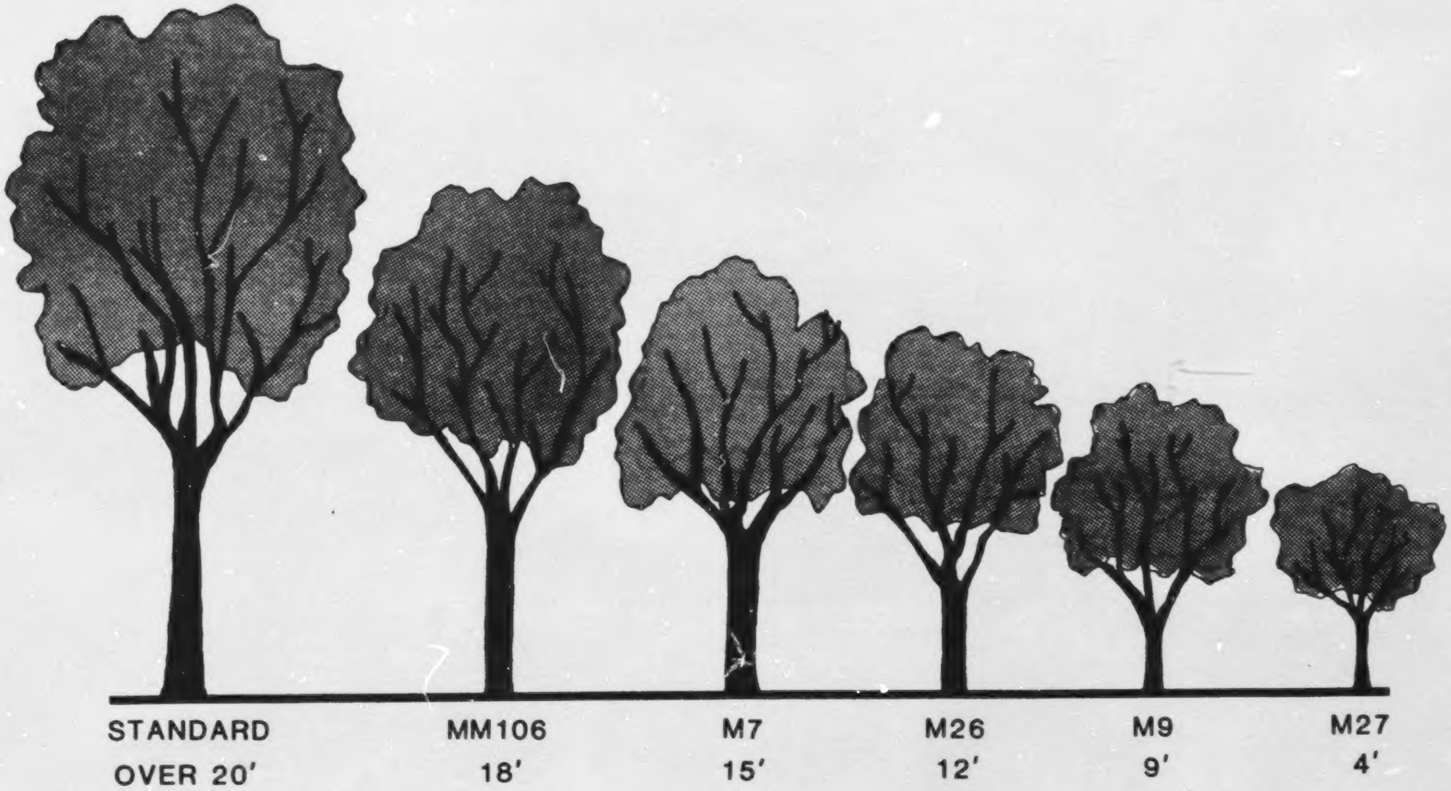
TRANSPLANTING FRUIT TREES


Remove can
before planting
Leave fiber pot
Roll burlap
back

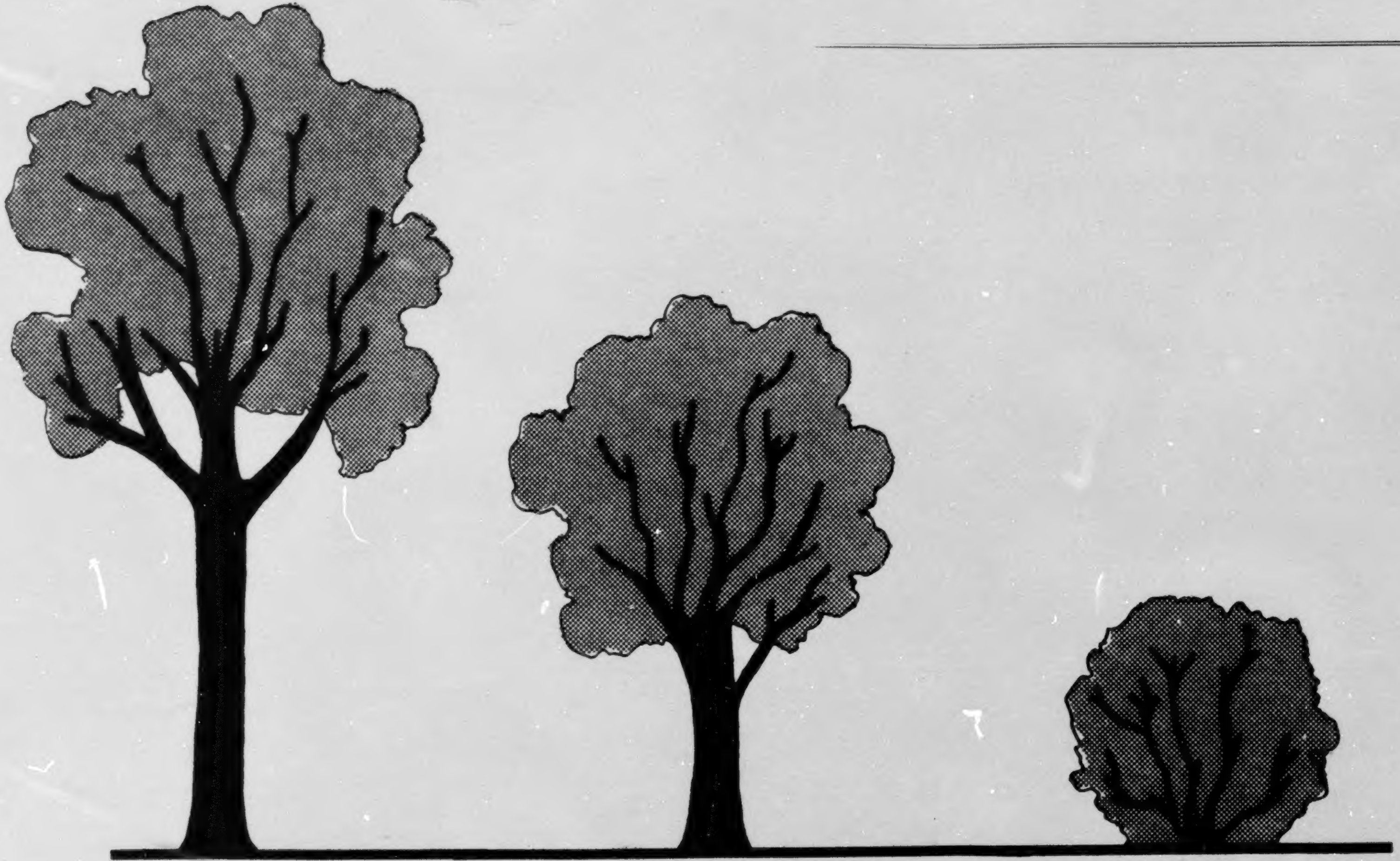
WHAT IS A DWARF TREE ?


Standard tree
Malling root stock

SIZES OF APPLE TREES


STANDARD
OVER 20'
MM106
18'
M7
15'
M26
12'
M9
9'
M27
4'

SIZES OF PEACH TREES

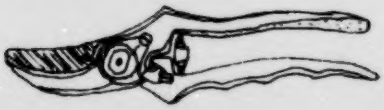


STANDARD
15′–18′

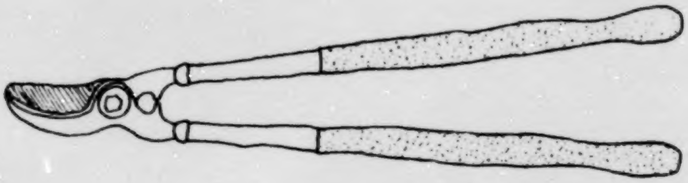
SEMIDWARF
7′–9′

GENETIC DWARF
4′–6′

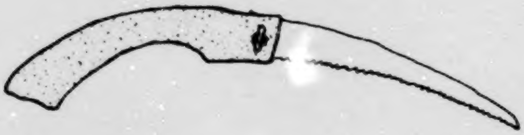
BASIC PRUNING TOOLS FOR TREE FRUITS



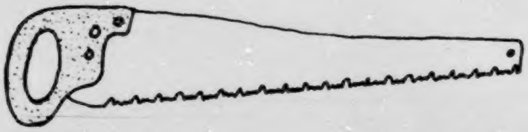
Hand Pruners



Lopping Shears



Curved Pruning Saw



Wide Blade Saw

TRANSPARENCY DISCUSSION GUIDE

GROWING TREE FRUITS

I. Transparency--FRUIT CLIMATE ZONES FOR ILLINOIS

A. The Midwestern States are divided into 5 hardiness zones.

B. Zones 4 and 5 are the only two zones in Illinois.

C. Fruit trees grown in Climate Zone 4 usually need some type of protection against cold temperatures.

D. Climate Zone 5 is much milder and can support many fruit tree varieties.

II. Transparency--TRANSPLANTING FRUIT TREES

A. If the tree is bought in a metal container, make sure the container is removed before planting.

B. Fiber pots can be left on when planting.

C. Burlap can be left on for planting, but it should be rolled back some.

D. In all three cases, the soil ball should be covered completely by first adding soil in layers into the hole.

E. Mound 6 inches of soil around the plant, leaving a well around the trunk to catch water.

F. Refer to Metropolitan Core Curriculum II, Unit L, Problem Area 4, pages 7 and 8 for more information on transplanting in general.

G. Fruit trees should be transplanted when they are in the dormant stage.

III. Transparency--WHAT IS A DWARF TREE?

A. A dwarf tree actually consists of 2 separate trees.

B. The malling tree provides the roots and the standard apple tree provides the fruit.

IV. Transparency--APPLE TREE SIZE DIFFERENCES

A. The M (Malling) and MM (Merton Malling) rootstock numbers determine apple tree size.

B. M27 is the most dwarfing rootstock reaching a height of 4 feet.

C. M9 is less dwarfing, reaching a height of 9 feet.

D. M26 reaches a height of 12 feet.

E. M7 is considered semi-dwarf, reaching a height of 15 feet.

F. MM106 is the largest semi-dwarfing rootstock, reaching a height of 18 feet.

V. Transparency--SIZES OF PEACH TREES

A. The standard peach tree needs pruning to keep it at a manageable height.

B. The semi-dwarf requires pruning to maintain it and to encourage new fruiting wood.

C. The genetic dwarf is a bush shape and does not need pruning. It is not very winter hardy.

VI. Transparency--BASIC PRUNING TOOLS FOR TREE FRUITS

A. There are 4 basic pruning tools for tree fruits.

B. The hand pruning shears are for the smallest branches.

C. Lopping shears are used on branches up to 1¼ inches in diameter.

D. The curved pruning saw is used on branches up to 2 inches in diameter.

E. The wide blade saw is used on the largest limbs.

SAMPLE TEST QUESTIONS AND TEACHER'S KEY

GROWING TREE FRUITS

TRUE OR FALSE:

False 1. Mulching, cultivating, mowing and herbicides are common methods of disease control.

True 2. Herbicides can be wettable powders, liquids or granules.

True 3. Fruit trees should be protected from weed competition for five years after planting.

True 4. A herbicide is used for weed control.

False 5. The same herbicides cannot be used on apple, peach or cherry trees.

True 6. It is best to follow a year-round schedule when maintaining fruit trees.

True 7. Most pruning of apple and peach trees is done in the spring.

False 8. Any variety of fruit can be planted in any geographical area.

True 9. Fruit trees will do best in full sun.

False 10. Pruning fruit trees has no effect on fruit yield.

SHORT ANSWER:

1. A tree consisting of parts from 2 or 3 trees is a dwarf tree.
2. Dwarf apple trees can vary in size from 4 feet to 18 feet.
3. On apple trees the fruit grows on a spur.
4. The most troublesome insect for apples is the codling moth.
5. The three major varities of apples are Delicious, Jonathan and McIntosh.
6. Peach trees may be purchased in three sizes: Standard, Semi-dwarf, and Genetic dwarf.
7. Peaches grow on last year's growth.
8. A pole pruner can be used to prune branches that are 12-16 feet above the ground.

9. Lopping shears are used to prune trees with wood diameters of ½-1 inch, while handpruning shears are used to prune trees with wood diameters up to ½ inch.

10. Once the fruit crop is starting to grow, thinning out is done to allow for the best growth possible without crowding.

UNIT H: IDENTIFYING AND CONTROLLING PESTS OF HORTICULTURAL PLANTS

PROBLEM AREA: HANDLING PESTICIDES SAFELY AND PASSING CERTIFICATION TESTS

SUGGESTIONS TO THE TEACHER:

This problem area is designed for use with eleventh grade or advanced students in a horticultural or agricultural occupations program. This problem area may be taught at any time during the year and therefore may be incorporated in the winter months. Schedule when few outdoor activities are possible.

The estimated instructional time for this problem area is 5-10 days depending on how far the teacher wishes to go in developing safety skills and knowledge necessary to pass specific certification tests. It is assumed that information in Unit H of Metro Core I and Metro Core II have been discussed and appropriate skills acquired. It is suggested that instructors be certified before attempting to teach this problem area.

The instructor is encouraged to conduct a local search to locate supplementary materials for use with this problem area. The items in this problem area are for reference or modification as instructors adapt this problem area to their local situation.

CREDIT SOURCES:

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The teacher's guide, information sheets, student worksheets and sample test questions were developed by Al Zwilling, Department of Vocational and Technical Education, University of Illinois and James Ethridge, Joliet Junior College. Transparency masters and the transparency discussion guide were prepared by the Vocational Agriculture Service, University of Illinois. Suggestions and guidance in the development of these materials were provided by the Metropolitan Core Curriculum Field Test Teachers.

TEACHER'S GUIDE

I. Unit: Identifying and controlling pests of horticultural plants

II. Problem area: Handling pesticides safely and passing certification tests

III. Objectives: At the end of this problem area, students will be able to:

1. Identify and demonstrate the use of protective clothing and equipment used in the safe handling of pesticides.

2. Demonstrate the proper procedures of measuring, mixing, loading and applying pesticides safely and in the proper concentrations.

3. Identify safety precautions when transporting, storing, cleaning up and disposing of pesticides and their containers.

4. Interpret essential label information on pesticide containers.

5. Select and apply appropriate controls for specific pests.

6. Recognize the symptoms of pesticide poisoning and apply appropriate first aid treatments to victims.

7. Identify major terms, governmental laws and environmental regulations associated with pest control.

8. Successfully complete the private and/or commercial pesticide applicators certification tests.

IV. Suggested interest approaches:

1. Relate stories of incidents where pesticides have been improperly used or stored.

2. Ask students to name some common pesticides and where they have seen them used. Record the name of the pesticide and its use on the chalkboard.

3. Ask students how many of them would like to obtain their private applicator's license. Ask students to explain what this permits them to do.

4. Have a resource person (pesticide applicator, chemical salesperson) discuss pesticide safety and identify safety problems they have incurred through their experiences.

5. Many fruit growers keep bees in their orchards. Ask students what precautions must be taken by the grower and pesticide applicator to insure the bees' safety.

6. Role play a pesticide accident or injury including first aid treatments. Discuss with students the reasons why the accident occurred and preventative measures that should have been taken. Also discuss whether the first aid measures applied were appropriate.

7. A local nursery is situated close to a park and pond. Ask the students what precautions must the pesticide applicator take to insure the safe use of this area for swimming, fishing and recreation.

V. Anticipated problems and concerns:

1. What protective clothing should be worn when handling pesticides?

2. What protective equipment should be available while handling pesticides and how is it used?

3. What safety precautions should be followed when handling pesticides?

4. How do you safely measure, mix, and load pesticides into the proper applicators?

5. What are the different types of pesticides and what do they control?

6. How do you determine which chemical control to use for specific pests?

7. What equipment is necessary and how do you properly apply pesticides?

8. How do you transport and store pesticides safely?

9. How do you dispose of unused pesticides and their containers? How can you avoid this problem?

10. If an accident or spill occurs when using pesticides, what should be done?

11. What information is given on a pesticide label and how is it interpreted?

12. What are the symptoms of pesticide poisoning and how should they be treated?

13. What are the major terms I should know before working with pesticides?

14. What is the Federal Environmental Pesticide Control Act?

15. What are the local, state, and federal laws and environmental regulations regarding the application of pesticides?

16. How can you protect wildlife and the environment when applying pesticides?

17. Why should I be certified and how do I obtain certification for private and/or commercial pesticide application?

VI. Suggested learning activities and experiences:

1. Show VAS Filmstrip 1108 - Understanding and Safe Use of Pesticides; 1108-1.2 - Selecting and Handling Pesticides; and 1108-2.1 - Safe Use of Pesticides Around the Home.

2. Have a student put on protective clothing and equipment used when handling pesticides. Have another student or students explain the reasons for using the safety equipment.

3. Discuss Information Sheet 1 - Pesticide Terms and Definitions.

4. Show and discuss VAS Transparencies - Safe Use of Pesticides. Selected transparency masters are included in this problem area.

5. Have students complete Student Worksheet 1 - Reading Label Directions using VAS Subject Matter Unit 4045a - Handling and Using Pesticides Safely. This can be done as a supervised study or homework assignment. Go over the worksheet as a class project, asking individual students to respond to specific questions.

6. Bring in various pesticides (empty containers) used to control weeds, diseases and insects. Have students complete Student Worksheet 2 - Interpreting Information on Pesticide Labels on an individual basis.

7. Have students select appropriate controls and application equipment for specific pests. Discuss Information Sheet 4 - Advantages and Disadvantages of Application Equipment.

8. Demonstrate the proper procedures of measuring, mixing and loading pesticides into application equipment safely. Have students practice using artificial, non-toxic materials.

10. Contact a Poison Resource Center located in your area. Have a resource person from the center discuss the proper first aid procedures in the event of poisoning. Hand-out Information Sheet 5 - Poisoning and First Aid Treatments.

11. Conduct a community pesticide safety program on the proper use of pesticides as an FFA project.

12. Develop a bulletin board displaying major pesticides. These may be collected from magazines.

13. Survey local home owners to find out what pesticides they use.

14. Invite a representative from a lawn maintenance company to speak to the class on the topic of safety in the use of lawn pesticides. Tour local turfgrass areas where pesticides are being applied.

15. Have students work problems given in the VAS Student Manual - Problems for Pesticide Calibration.

16. Arrange for students to take certification tests. Discuss Information Sheet 2 - Pesticide Applicator Certification - Why and How? and Information Sheet 3 - Items Pesticide Applicators and Operators Are Expected to Know For Certification.

17. Use the competency inventory to discuss entry level requirements for working with pesticides. Have students complete the competency inventory at the end of the unit, so they can assess their progress.

VII. Application procedures:

1. The purpose of this problem area is to develop the ability of the student to handle and apply pesticides safely.

2. Students will be able to apply their knowledge at home or when working in a horticultural business.

3. Students will be able to pass the pesticide certification test.

VIII. Evaluation:

1. Collect and evaluate student worksheets.

2. Administer and evaluate test using sample test questions included in this problem area.

3. Check progress through use of the competency sheet.

4. Have students complete certification test.

5. Observe student performance when working with pesticides.

IX. References and aids:

1. Vocational Agriculture Service, University of Illinois, 1401 South Maryland Drive, Urbana, Illinois 61801

    a. VAS Unit 4045a - Handling and Using Pesticides Safely

b. VAS Slidefilms 1108 - Understanding and Safe Use of Pesticides
   1108-1.2 - Selecting and Handling Pesticides
   1108-2.1 - Safe Use of Pesticides Around the Home
   1108-3.1 - The Pesticide Review Process

c. VAS Transparencies - Safe Use of Pesticides

d. Tips and Facts for Continued Safe Use of Pesticides

e. Student Manual - Problems for Pesticide Calibration

f. Teacher's Key - Problems for Pesticide Calibration

2. Metropolitan Core Curriculum I and II; Unit H

3. Illinois Pesticide Applicator Study Guide (Revised), General Standards, Training Manual for Private and Commercial Applicators and Operators, Cooperative Extension Service, University of Illinois at Urbana-Champaign

COMPETENCY INVENTORY

HANDLING PESTICIDES SAFELY AND PASSING CERTIFICATION TESTS

1. Student has no knowledge of competency.
2. Student has read about competency.
3. Student has seen competency performed.
4. Student has performed competency.
5. Student has performed competency without supervision.
6. Student does possess skill.
7. Student does not possess skill.

	Competency	Circle One						
1.	Check application equipment for leaks	1	2	3	4	5		
2.	Select chemicals for specific problems	1	2	3	4	5		
3.	Read and interpret package labels	1	2	3	4	5		
4.	Control pests on horticultural plants	1	2	3	4	5		
5.	Summarize the precautions which should be followed	1	2	3	4	5		
6.	Calibrate pesticide applicator	1	2	3	4	5		
7.	Dispose of empty containers	1	2	3	4	5		
8.	Clean up equipment after use	1	2	3	4	5		
9.		1	2	3	4	5		
10.								
11.								
12.								
13.	Identify pests that are of major concern in your area						6	7
14.	Identify pesticide damage in crops						6	7
15.	Recommend kinds and rates of pesticides						6	7
16.	Describe protective equipment needed						6	7
17.	Describe protective clothing						6	7
18.	Describe places and methods of storage						6	7
19.	Recognize and describe equipment parts						6	7
20.	Follow accepted procedures in accident situations						6	7
21.	Select chemicals for specific problems						6	7

These competencies outlined in the National Ag Occupations Competency Study are for entry level positions in horticulture.

Name Date

INFORMATION SHEET 1

PESTICIDE TERMS AND DEFINITIONS

1. ABSORB -- To take a pesticide or other material into a plant, animal or the soil

2. ACTIVE INGREDIENT -- The actual amount of pesticide in the formulation

3. ACUTE POISONING -- Poisoning which occurs after a single exposure to a pesticide

4. ADJUVANT -- Chemical added to a pesticide mixture that helps the active ingredient do a better job

5. ANTIDOTE -- Treatment given by a medically trained person to reduce the effects of pesticide poisoning

6. APPLICATION -- Process of directing or placing pesticides on or in plants, animals, buildings, soil, air, water, or other site

7. BROAD SPECTRUM (NONSELECTIVE) -- Pesticide which is toxic to a wide range of pests; used when several different pests are a problem

   (NOTE: Short term, residual, and broad spectrum are often used in describing insecticides and miticides.)

8. CANNISTER -- Metal or plastic container filled with absorbent materials to filter fumes and vapors from the air

9. CARTRIDGE -- Cylinder-shaped part of the respirator which absorbs fumes and vapors from the air

10. CERTIFICATION -- Recognition by certifying agency that a person is competent and thus authorized to use or supervise the use of restricted use pesticides

11. CHRONIC POISONING -- Poisoning which occurs as a result of repeated exposures to pesticides over a period of time

12. COMPATIBLE CHEMICALS -- Chemical that can be mixed together without decreasing their effectiveness against the intended pests

13. CONTACT POISON -- Pesticide which kills when it touches or is touched by the pest

14. CONTAMINATE -- Pollute or make unfit for use

15. DERMAL TOXICITY -- How poisonous a pesticide is to man or animal when in contact with the skin

16. DILUENT -- Liquid, such as water, kerosene, alcohol, or dust, which "waters down" or weakens a concentrated pesticide

17. DILUTE -- To make a pesticide thinner or weaker by adding water, oil, or other material

18. DISPOSAL -- Act or process of correctly discarding pesticides and pesticide containers; can include recycling, deposit-return, reuse, or burning

19. DOSE, DOSAGE -- Portion or amount of pesticide mixture which is directed at the target

20. DOWNWIND -- Direction toward which the prevailing wind is blowing

21. DRIFT -- Movement by wind and air currents of droplets or particles of a pesticide

22. ENCAPSULATION -- Method of disposal of pesticides and pesticide containers by sealing them in a sturdy, waterproof, chemical-proof container which is then sealed in thick plastic, steel, or concrete to resist damage or breakage

    (NOTE: The whole package is then usually buried in an area where water could not be contaminated even if leakage occurs.)

23. ENVIRONMENT -- Surroundings, usually water, air, soil, plants, and animals

24. EPA -- (United States) Environmental Protection Agency

25. EXPOSURE -- Not protected or shielded; contact with pesticides through mouth, lungs or skin

26. FACE SHIELD -- Piece of protective equipment used by a pesticide applicator to protect face from exposure

27. FIRST AID -- First effort to help a victim of poisoning while medical help is on the way

28. FORMULATION -- The form that a pesticide is offered for sale to the user (wettable powder, granule, dust, oil solution, etc.), includes the active and inert ingredients

29. FUME -- Unpleasant or irritating smoke, vapor, or gas

30. FUMIGANT POISON -- Pesticide which enters the pest in the form of a gas and kills it

31. FUNGICIDE -- Pesticide used to prevent, destroy, repel or mitigate fungal infections

32. HAZARD -- Risk of danger; chance that injury or harm will come to the applicator, other persons, plants, or animals

33. HERBICIDE -- Pesticide that is used to control unwanted plants

34. INERT INGREDIENT -- Part of the pesticide formulation that is not active such as water, wetting and spreading agents, emulsifiers, etc.

35. INHALATION -- To take air into the lungs; to breath in

36. INHALATION TOXICITY -- How poisonous a pesticide is to man or animal when breathed in through the lungs

37. INSECTICIDE -- A pesticide used to prevent, destroy, repel, mitigate, or attract insects and their relatives

38. LC_{50} -- Concentration of a pesticide in the air which would kill half of a large number of test animals exposed to it

(NOTE: The lower the LC number value, the more poisonous the pesticide. It is often used as the measure of acute inhalation toxicity. LC stands for lethal concentration.)

39. LD_{50} -- Dose or amount of a pesticide which would kill half of a large number of test animals if eaten or absorbed through the skin

(NOTE: The lower the LD number value, the more poisonous the pesticide. LD number values are the commonly used measures of acute oral or acute dermal toxicity. LD stands for lethal dose.)

40. LETHAL -- deadly

41. MITICIDE -- A pesticide used to kill mites (acaricide)

42. MONITORING SYSTEM -- Regular system of keeping track of and checking up on whether or not pesticides are escaping into the environment

43. NEMATICIDE -- A pesticide used to prevent, repel, or destroy nematodes

44. NONSELECTIVE -- Pesticide which is toxic to all plants or animals of a type; usually used to describe a particular type of pesticide

Example: A nonselective herbicide would kill or injure all plants in the application site but would not kill insects, animals, or other organisms.

45. NOZZLE -- Device for metering and dispersing a spray solution

46. ORAL -- Through the mouth

47. ORIGINAL CONTAINER -- Package (bag, can, or bottle) in which a pesticide is sold

(NOTE: The package must have a label telling what the pesticide is, how to use it correctly and safely, and how to safely dispose of the empty container.)

48. PESTICIDE -- Chemical or other substance that will prevent, repel, destroy or control a pest or protect something from a pest

49. PHYTOTOXICITY -- Causing injury to plant life

50. POLLUTE -- To make unclean or unsafe

51. REENTRY INTERVAL -- Period of time between a pesticide application and when persons may reenter an area without wearing protective clothing and equipment

52. RESIDUAL (PERSISTANCE) -- Property of a pesticide to remain in the environment several days or weeks after application in amounts sufficient to kill pests

53. RESIDUE -- The amount of pesticide present following application

54. RESPIRATOR -- Face mask which filters out poisonous gases and particles

    (NOTE: A respirator is used to protect the nose, mouth, and lungs from pesticide injury.)

55. SELECTIVE -- Pesticide which is more toxic to some types of plants or animals than to others; usually used to describe a particular type of pesticide

    Example: A selective herbicide would kill crabgrass in a cornfield but would not injure the corn.

56. SHORT-TERM (NONPERSISTENT) -- Pesticide that breaks down almost immediately into nontoxic by-products

57. SOLUTION -- A mixture in which a pesticide is dissolved in a liquid

58. STOMACH POISON -- Pesticide which kills when swallowed

59. SURFACE SPRAY -- Pesticide spray which is evenly applied to the outside of the object to be protected

60. SYSTEMIC -- Pesticide that is taken up by one part of a plant or animal and moved to another section where it acts against a pest

61. TARGET -- Pest to be treated with a pesticide

62. TOLERANCE -- Maximum amount of a pesticide which can legally remain on or in any food or feed crop at harvest or animal at slaughter

63. TOXICITY -- Capacity of a pesticide to cause harm to a living organism

64. VAPORIZE -- To form a gas and disappear into the air

INFORMATION SHEET 2

PESTICIDE APPLICATOR CERTIFICATION -- WHY AND HOW?

WHY MUST I BE CERTIFIED?

Certification is a requirement due to federal and state regulations. The Federal Environmental Pesticide Control Act (The Federal Insecticide, Fungicide, and Rodenticide Act of 1947, amended in 1972 - FIFRA) regulates the use of pesticides to protect humans and the environment.

1947 ACT -	Designed to regulate the marketing of pesticides, especially those "economic poisons" which were moved through interstate commerce.
1972 ACT -	Went much farther to regulate the use or misuse of pesticides, certification of applicators, and regulates marketing at both interstate and intrastate levels.

Any person who purchases or uses pesticides classified for "restricted use" must be certified as a Private Pesticide Applicator or as a Commercial Pesticide Applicator or Operator.

Private Pesticide Applicators - applies restricted use pesticides on their own land for the purpose of producing an agricultural commodity.

Commercial Pesticide Applicators or Operators - applies pesticides on the property of others either for hire or as a part of their job responsibilities.

HOW DO I BECOME CERTIFIED?

PRIVATE PESTICIDE APPLICATOR:

You can obtain certification as a Private Pesticide Applicator by completing a training session conducted by the Cooperative Extension Service, University of Illinois at Urbana-Champaign. An official of the Illinois Department of Agriculture will be present at the training session to register those attending. Each person seeking certification must fill out an application, complete the questions in a training evaluation form, and sign a statement saying that he or she understands the information presented at the training session, and the legal responsibilities for the use of pesticides in accordance with label instructions.

OR

A person may take a written examination for certification as a Private Pesticide Applicator as an alternative to participating in a training session. The examination will be graded, and a passing grade must be achieved to obtain certification. The examination is "open book", and is available from the county extension advisor, or the state or regional offices of the Illinois Department of Agriculture. There is no fee for certification as a Private Pesticide Applicator. Certification is valid for five years.

INFORMATION SHEET 2 - continued

COMMERCIAL PESTICIDE APPLICATOR OR OPERATOR:

To become a commercial pesticide applicator you must pass a General Standards (Core) Examination before taking a Category Specific Examination. You must apply for your license within 90 days after notification of passing the exams. The General Standards and Category Specific Examinations are given at 10 Urban and 10 Agricultural Pesticide Dealers and Applicators Clinics held each year throughout the state. Examinations may be taken through the Illinois Department of Agriculture in addition to the clinics.

INFORMATION SHEET 3

ITEMS PESTICIDE APPLICATORS AND OPERATORS ARE EXPECTED TO KNOW FOR CERTIFICATION

1. Understand labels and labeling information and the classification of pesticides, general or restricted use.
2. Know the causes of pesticide accidents and how to guard against injury.
3. Realize the need for protective clothing and equipment.
4. Recognize the symptoms of pesticide poisoning and be able to administer appropriate first aid treatment.
5. Know how to handle, store and dispose of pesticides properly.
6. Be aware of the influence of pesticides on the environment.
7. Identify common pests to be controlled.
8. Be familiar with pesticide formulations and factors affecting their effectiveness.
9. Know the common types of equipment and techniques of application.
10. Know how to calibrate application equipment.
11. Understand laws and regulations.

INFORMATION SHEET 4

ADVANTAGES AND DISADVANTAGES OF APPLICATION EQUIPMENT

EQUIPMENT	ADVANTAGES	DISADVANTAGES
Aerosol (bomb and generator)	Penetrates cracks and crevices; usually reaches all pests within the area; area can be used soon after treatment by ventilating	No deposit, therefore reaches only the pests in the area during application; difficult to get long term control; special pesticide formulation necessary; drift hazard
Duster (hand and power)	Lightweight; inexpensive; requires no water	Drift hazard; high cost of pesticide; hard to control amount of application; must calibrate for each product
Granular applicator	Lightweight; no water needed; often used in fertilizer spreader or seeder	High cost of pesticide; limited foliar use; must calibrate for each size of granule
Hand sprayer	Economical; simple; easy to use and clean	Not practical for large areas; lacks agitation; wettable powder may clog nozzles
Air-blast sprayer	Good coverage and penetration; low pressure pump; mechanical agitation	Drift hazard; chance of overdose; difficult to use in small areas; hard to confine discharge to a limited target
Low pressure field sprayer	Low cost; lightweight; versatile; covers large areas rapidly	Low volume output limits pesticide penetration; agitation is limited
High pressure field sprayer	Well-built; long life; usually has mechanical agitation; very versatile	Expensive; requires large amounts of water, power, and fuel; heavy tire loads; drift hazard
Ultra-low volume sprayer	No water is needed; equal control with less pesticide	Does not provide for thorough wetting; hazard in using high concentrations; chance of overdose; small numbers of pesticides can be used

INFORMATION SHEET 5

POISONING SYMPTOMS AND FIRST AID TREATMENTS

Mild Poisoning Symptoms

- fatigue
- headache
- dizziness
- blurred vision
- too much sweating and salivation
- nausea and vomiting
- stomach cramps or diarrhea

Moderate Poisoning Symptoms

- unable to walk
- weakness
- chest discomfort
- muscle twitches
- constriction of pupil of the eye
- earlier symptoms become more severe

Severe Poisoning Symptoms

- unconsciousness
- severe constriction of pupil of eye
- muscle twitches
- secretions from mouth and nose
- breathing difficulty
- death if not treated

Illness may be delayed a few hours. But if signs or symptoms start more than 12 hours after you were exposed to the pesticide, you probably have some other illness. Check with your physician to be sure.

First Aid Procedures

Read the directions in the "Statement of Practical Treatment" on each label. These instructions can save your life and the lives of your employees.

If you get a pesticide on your skin:

- Remove the pesticide as quickly as possible. Remove all contaminated clothing. Prompt washing may prevent sickness even when the spill is very large. Don't forget your hair and fingernails. Water-wettable powders or suspensions are easy to remove with plain water. So are most emulsifiable concentrates and emulsions. Solutions of pesticides in petroleum oil or other solvents are harder to remove without soap or a detergent. Detergents work better. Washroom and emergency field washing facilities should have detergents rather than plain soap.

INFORMATION SHEET 5 - continued

If you inhale a pesticide:

-Get to fresh air right away.

If you splash a pesticide into your mouth or swallow it:

-Rinse your mouth with plenty of water
-Go or be taken to a physician immediately
-It is sometimes dangerous to cause vomiting; follow label directions.

STUDENT WORKSHEET 1

READING LABEL DIRECTIONS

(For use with example label in VAS Subject Matter Unit 4045a.)

1. What is the classification of the pesticide?__________________________

2. What is the company's brand name?________________________________

3. What type of pesticide is it?______________________________________

4. What type of formulation is used in the pesticide?____________________
____

5. What is the toxic chemical in the pesticide?_________________________
What is the percent of active ingredient in the pesticide?______________

6. Which pests does this pesticide control?____________________________
In what form should the mixture be applied?__________________________
How much should be used?____
Where should the material be applied?_______________________________
When should it be applied?____

7. How toxic is this pesticide?______________________________________

8. What is stated in the Statement of Practical Treatment?

9. What is the manufacturer's name and address?_______________________
________________ Why is this important?___________________________
____

10. How should this pesticide be stored and disposed?

11. What is the reentry period for this pesticide?________________________

12. Does this pesticide have any precautionary statement?_________________

STUDENT WORKSHEET 2

INTERPRETING INFORMATION ON PESTICIDE LABELS

1. Name of pesticide ______________________________

2. Name of manufacturer ______________________________

3. Weight or volume of pesticide ______________________________

4. Type of pesticide: Insecticide ______________________________
   Herbicide ______________________________
   Fungicide ______________________________

5. Time of application: Preemergence ______________________________
   Postemergence ______________________________

6. Weeds, insects or diseases that can be controlled ______________________________
   ____
   ____
   ____
   ____
   ____

7. Type of formulation: Solution ______________________________
   Emulsifiable Concentrate ______________________________
   Wettable Powder ______________________________
   Granular ______________________________

8. Precautions:

   a. What danger(s) does the pesticide present to humans and/or animals?

   b. Areas where the pesticide should not be used.

   c. Proper method of disposal of empty container.

   d. Suggestions for pesticide storage.

10. Application:

   a. Recommended time of application (time of year).

   b. Recommended rate of application.

   c. Suggested methods for application.

STUDENT WORKSHEET 3

IDENTIFICATION AND STORAGE OF PESTICIDES

OBJECTIVES:

1. To make the students aware of the pesticides they use at home, school, or work.

2. To develop the ability to recognize, classify and store pesticides safely.

MATERIALS:

1. Sheet of paper
2. Pencil or pen
3. Pesticides at home, school or work

PROCEDURES:

1. Have students look at the pesticides located at home, the school greenhouse, or at a horticultural business where they work.

2. The students should read the labels of the pesticides and give the following information for each pesticide:

   A. Name of pesticide
   B. What it controls
   C. Classification of pesticide
   D. How the pesticide should be stored

3. Submit list to instructor for evaluation

QUESTIONS:

1. Were most of the pesticides general or restricted use pesticides?

2. Would most require a person to have passed a certification test in order to use them?

3. Were the pesticides stored safely?

OBSERVATIONS:

If these pesticides were located at your home, how would you store and label them.

APPLICATIONS:

The students should be able to identify pesticides easier, and locate the important information on the labels.

TEACHER'S KEY - STUDENT WORKSHEET 1

READING LABEL DIRECTIONS

(For use with example label in VAS Subject Matter Unit 4045a.)

1. What is the classification of the pesticide? Restricted use pesticide.

2. What is the company's brand name? De Pesto

3. What type of pesticide is it? Insecticide

4. What type of formulation is used in the pesticide? Emulsifiable concentrate

5. What is the toxic chemical in the pesticide? Pestoff--trisalicylic acid. What is the percent of active ingredient in the pesticide? 45.0%

6. Which pests does this pesticide control? Alfalfa weevil, snout beetle
   In what form should the mixture be applied? spray
   How much should be used? (variety of answers)
   Where should the material be applied? Only in pure alfalfa fields
   When should it be applied? Only once per year when feeding is noticed

7. How toxic is this pesticide? Highly toxic

8. What is stated in the Statement of Practical Treatment?
   If swallowed induce vomiting by giving a tablespoonful of salt in a glass of warm water. Repeat until vomitus is clear. Call a physician immediately. If inhaled--remove to fresh air. Call a physician. If in eyes--flush eyes with plenty of water for at least 15 minutes. Call a physician. If on skin--remove contaminated clothing and immediately wash skin with detergent and water.

9. What is the manufacturer's name and address? A-Z Chemicals,--Chemton, Nevada Why is this important? In case user has a specific question about use or antidote for treatment

10. How should this pesticide be stored and disposed? Do not contaminate water, food, or feed by storage or disposal. Should be disposed of in a landfill approved for pesticides or buried in a safe place away from water supplies. Containers should be triple rinsed and offered for recycling, reconditioning or disposed of in an approved landfill, or buried in a safe place

11. What is the reentry period for this pesticide? 48 hours

12. Does this pesticide have any precautionary statement? Yes

Key Pesticide Indicators

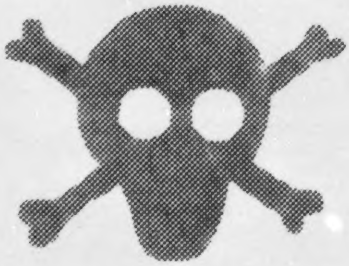
CAUTION

Slightly Toxic to Relatively Nontoxic

WARNING

Moderately Toxic

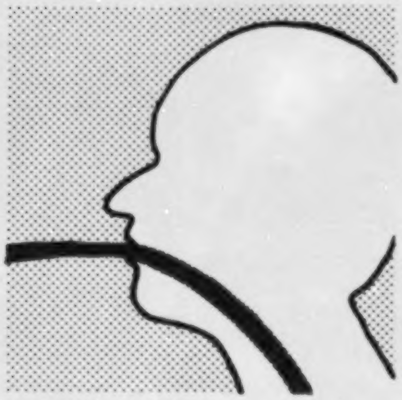
DANGER



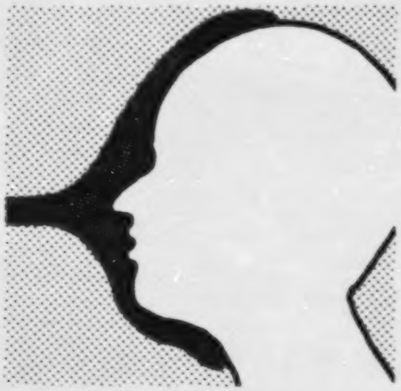
POISON

Highly Toxic

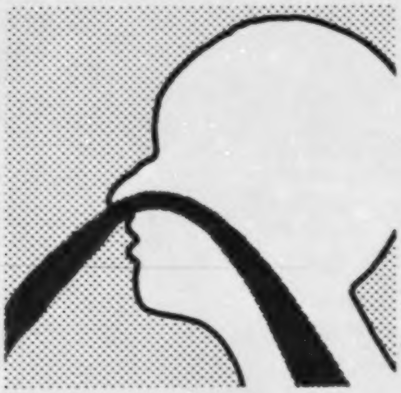
Methods of Pesticide Poisoning



Swallowing

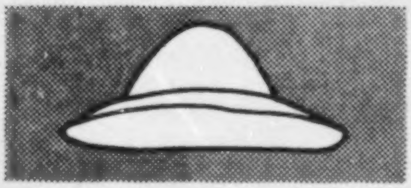


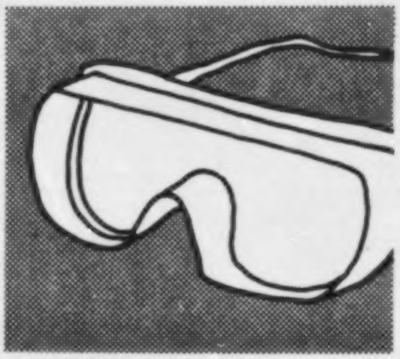
Exposure to Skin

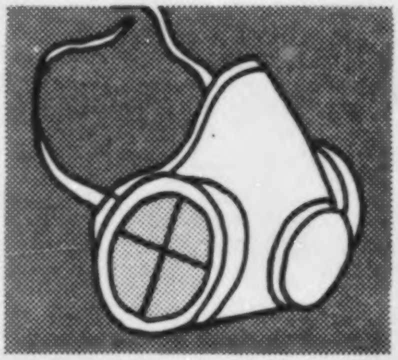


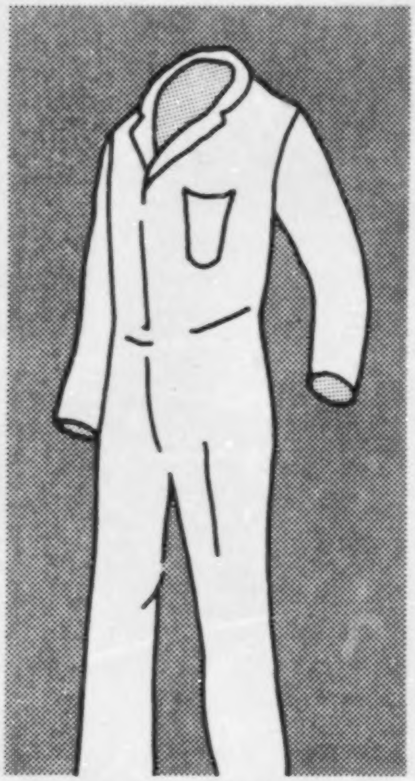
Breathing

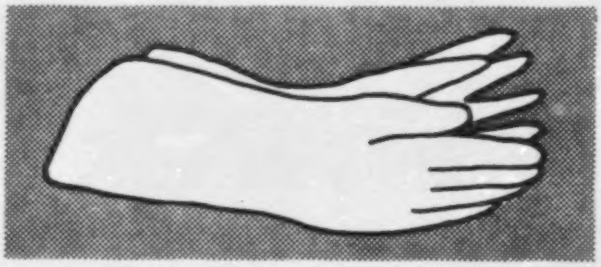
Recommended Protective Clothing and Equipment

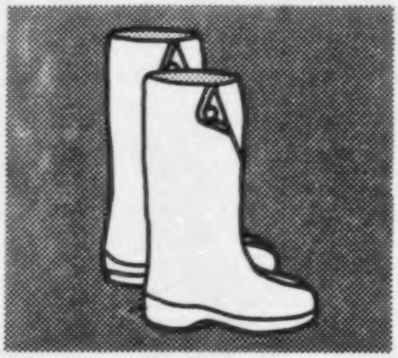

Waterproof Hat


Goggles

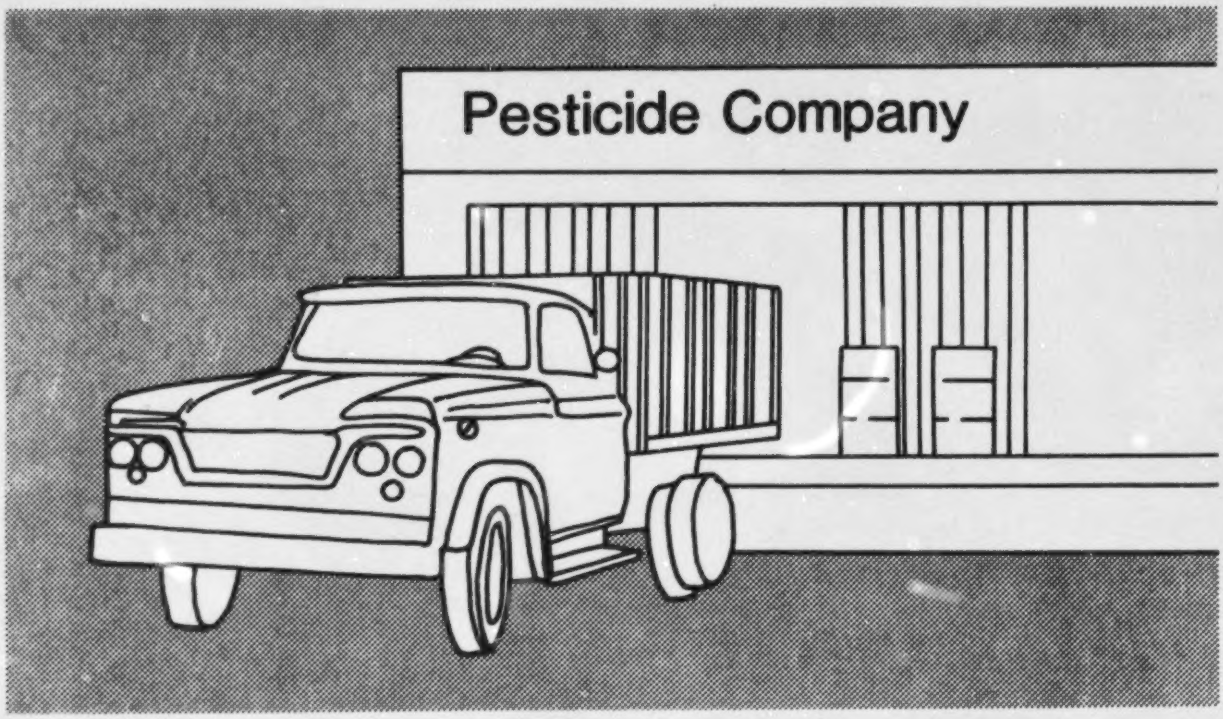

Respirator


Closely Woven Fabric Coveralls


Long Rubber or Neoprene Gloves


Rubber or Neoprene Boots

Safest Method of Disposal of Highly Toxic Containers


Pesticide Company

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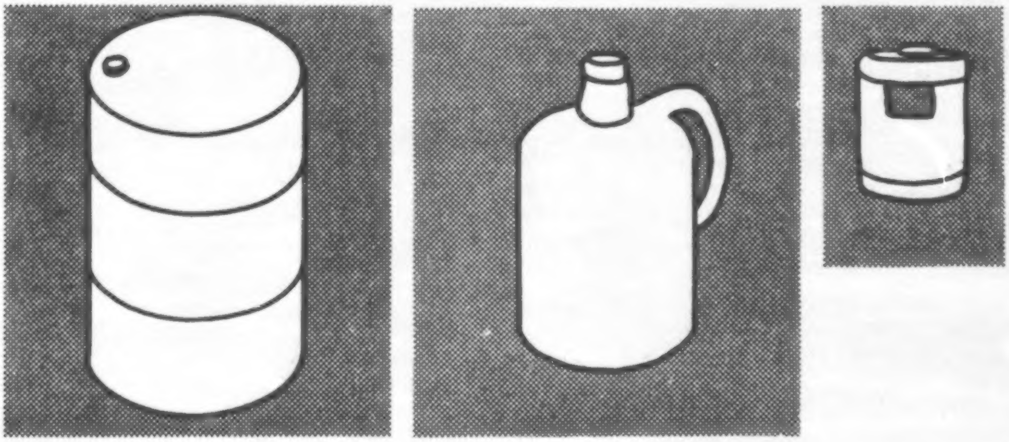
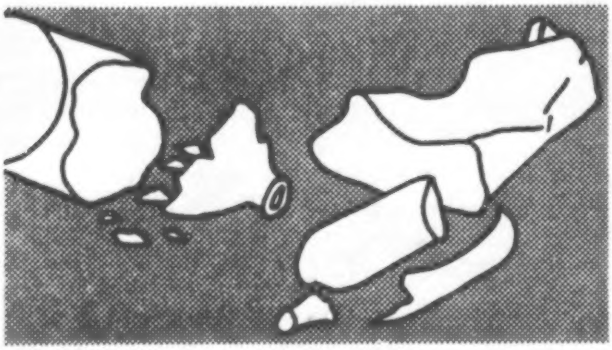
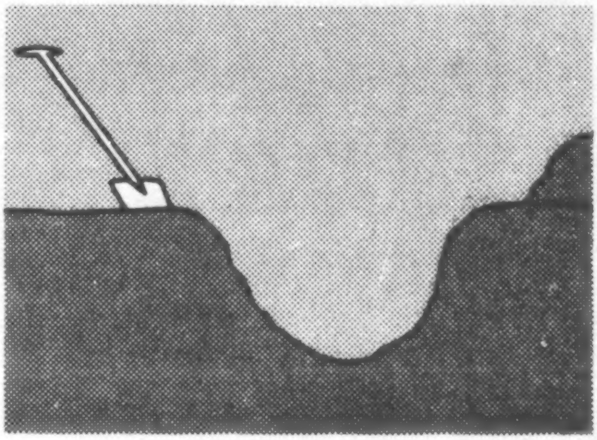
Other Methods of Disposal of Highly Toxic Containers

Nonburnable





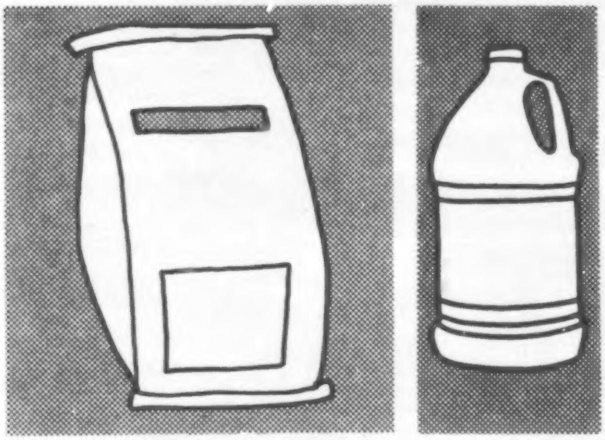
Break, Crush, or Cut Apart

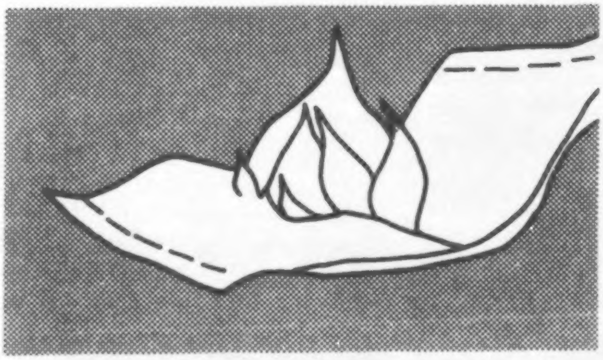


Then Bury

Other Methods of Disposal of Highly Toxic Containers

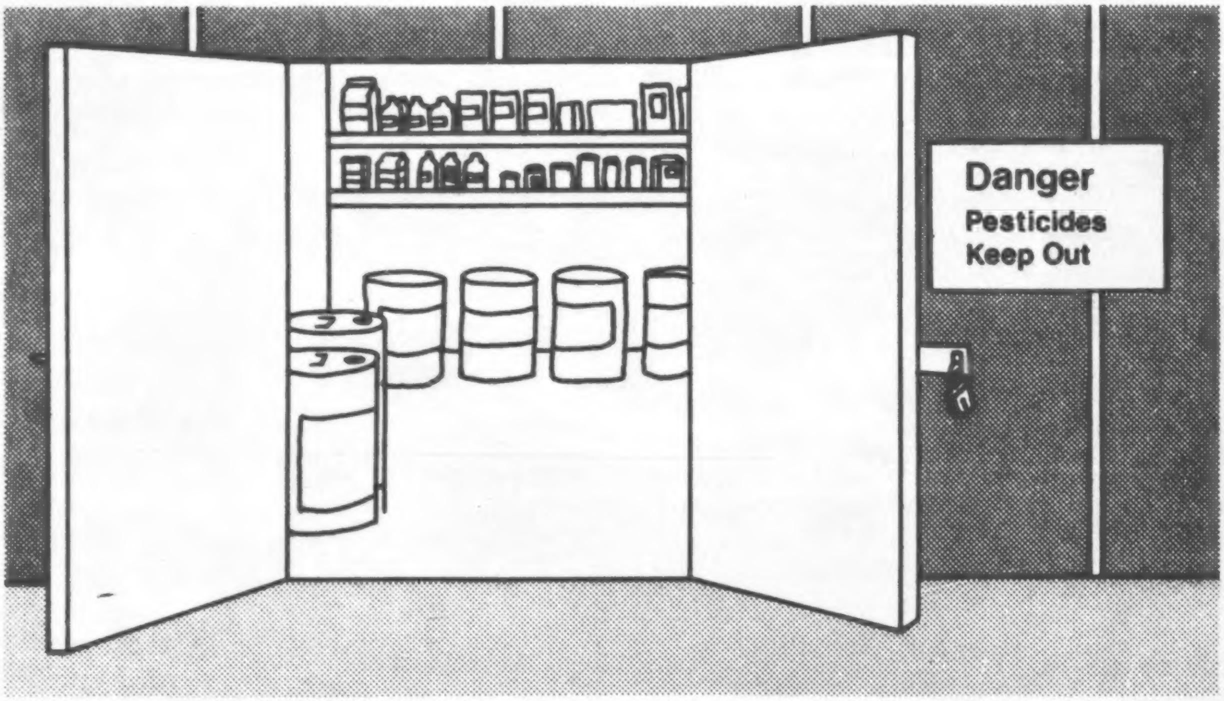
Burnable





Burning

Recommended Storage of Pesticides



Key Concepts

1. Store in separate building, room or enclosure.
2. Sacks, cartons, and fiber boxes should be stored on shelf.
3. Keep locked.
4. Use signs on outside of area.
5. Store only pesticides in area.
6. Make sure area is dry and the temperature can be controlled.
7. Store only in original containers with label in front.

TRANSPARENCY DISCUSSION GUIDE

HANDLING PESTICIDES SAFELY AND PASSING CERTIFICATION TESTS

I. Transparency--KEY PESTICIDE INDICATORS

A. Discuss the three signal words, and what each one means in terms of toxicity.

B. Have students cite examples of products where they have seen these signal words.

II. Transparency--METHODS OF PESTICIDE POISONING

A. Discuss pesticide poisoning by the three methods listed.

B. Have students give examples of how any of these accidents could happen.

III. Transparency--RECOMMENDED PROTECTIVE CLOTHING AND EQUIPMENT

A. Discuss each article of clothing and equipment.

B. Have students identify instances where these precautions would be very beneficial.

IV. Transparencies--TYPES AND DISPOSAL OF CONTAINERS

A. Discuss the three classifications of containers.

B. Describe how to dispose of the containers.

C. Discuss the Environmental Protection Agency's role in disposing of containers and waste.

V. Transparency--RECOMMENDED STORAGE OF PESTICIDES.

A. Discuss why it is important to have good pesticide storage.

B. Have students identify specific storage recommendations.

C. Have students plan a pesticide storage area and describe it to the class.

SAMPLE TEST QUESTIONS AND TEACHER'S KEY

HANDLING PESTICIDES SAFELY

TRUE OR FALSE

FALSE 1. A pesticide is a type of rodenticide.

TRUE 2. Downwind is the side towards which the prevailing wind is blowing.

TRUE 3. A stomach poison is a pesticide which kills when swallowed.

FALSE 4. A selective herbicide will kill or injure all plants in the application site.

FALSE 5. A fumigant poison is one that is taken up by one part of the animal or plant, and then moves to another section.

FALSE 6. One should wear their coveralls inside their boots when working with pesticides.

TRUE 7. The storage area for pesticides should be dry, cool, and out of direct sunlight.

FALSE 8. Most poisonings involving pesticides occur with adults.

TRUE 9. Transporting pesticides safely requires extra care on your part.

TRUE 10. If a pesticide will do little harm to the applicator or the environment, it will be classified as a general use pesticide.

MATCH THE TERM IN COLUMN 1 WITH ACTIVITY IN COLUMN 2.

H 1. Insecticides
G 2. Fungicides
E 3. Herbicides
A 4. Rodenticides
F 5. Nematicides
B 6. Defoliants
D 7. Disiccants
I 8. Bactericides
J 9. Miticides
C 10. Repellants

A. Controls rats and mice
B. Causes leaves to drop prematurely
C. Used to drive pests from a location
D. Causes plant tissue to dry out
E. Controls weeds
F. Controls nematodes
G. Controls fungi that cause plant diseases
H. Controls insects and insect relatives
I. Controls bacterial diseases
J. Controls mites

MULTIPLE CHOICE

B 1. Which part of the body has the highest dermal exposure?

A. Ear canal
B. Scrotal area
C. Scalp
D. Ball of foot
E. Palm of hand

A 2. Which of the following chemicals is the most toxic according to the LD$_{50}$ value?

A. LD$_{50}$ 5
B. LD$_{50}$ 10
C. LD$_{50}$ 50
D. LD$_{50}$ 75
E. None of the above

C 3. When "WARNING" is on the label it indicates that the pesticide is

A. Highly toxic
B. Slightly toxic
C. Moderately toxic
D. All of the above
E. None of the above

E 4. Which of the following formulations is defined as wettable powders sold as thick liquids to make them easier to add water?

A. Solutions
B. Wettable powders
C. Soluble powders
D. Granules
E. Flowables

D 5. Which of the following is not a recommended clothing precaution?

A. Boots
B. Gloves
C. Long sleeve shirt
D. Pants inside boots
E. Goggles

A 6. At which age do most pesticide poisonings in Illinois occur?

A. 0-3 years
B. 3-12 years
C. 13-25 years
D. 25-30 years
E. Over 30 years

B 7. Most accidental pesticide related deaths are caused by:

A. Improper use
B. Improper storage
C. Improper disposal
D. Improper interpretation of label
E. None of the above

D 8. Containers are classified into disposal groups. Which of the following is not a disposal group.

A. Burnable containers
B. Nonburnable containers
C. Burnable and nonburnable that contained highly toxic chemical
D. Buriable containers
E. None of the above

E 9. Which of the following is a good approved practice to follow when storing pesticides?

A. Store in separate building or room
B. Sacks, cartons, boxes, should be stored on a shelf
C. Padlock door to storage area
D. Put up warning signs
E. All of the above

D 10. All labels on pesticide include al. but:

A. Classification
B. Brand name
C. Directions for use
D. Directions for disposal of container
E. Statement of practical treatment

ESSAY

1. List and explain some of the approved practices for storage of pesticides.

(Refer to VAS Unit 4045a)

2. Discuss how to dispose of each type of container, and precautions to follow when disposing of containers.

(Refer to VAS Unit 4045a)

UNIT I: Urban Animals

UNIT I

UNIT I: URBAN ANIMALS

RATIONALE FOR OMITTING URBAN ANIMALS IN CORE III

A unit on urban animals which consisted of two problem areas was included in Core I. The original outline for Core II included additional problem areas on urban animals, but a decision to drop them from the Core was made. Problem areas on animals do have a place in an urban agriculture program because occupations which require knowledge and skills related to urban or companion animals are important. However, the following rationale was used to justify the dropping of urban animal problem areas from Core II and Core III:

1. The development of local short and long-range plans for vocational education programs in agriculture and the reimbursement of agricultural occupations programs is based on taxonomic areas of agriculture as defined by the U.S. Department of Education. Mixing horticulture and animals in the core curriculum may suggest to some schools that their local programs can follow this pattern and be approved for reimbursement.

2. A reasonable case can be made for including both horticulture and animals in Core I, II and III if these three years are to be taught as the occupational orientation phase of the agricultural occupations programs. However, since many urban schools in Illinois are presently offering only two or three years of agriculture/horticulture, it is reasonable to assume that, at least in some schools, Core I, II and/or Core III may be used primarily for the skill development phase of the agricultural occupations program.

3. Accordingly, the Illinois Joint Staff in Agricultural Education recommended that animals and horticulture not be mixed in Core II or Core III.

Schools which need to offer an urban agriculture program which includes more than the horticulture area should refer to the Rural Agriculture Program Core Curriculum for alternative areas of instruction.

Schools which need assistance in developing the agricultural occupations program according to guidelines and requirements established by the Illinois State Board of Education, Department of Adult, Vocational and Technical Education are encouraged to contact their Regional Administrator or the Occupational Consultants for Agriculture.